ENGINEERING AND MINING JOURNAL

MAR 1 1944

January, 1944

Postwar Mining, Milling, Smelting

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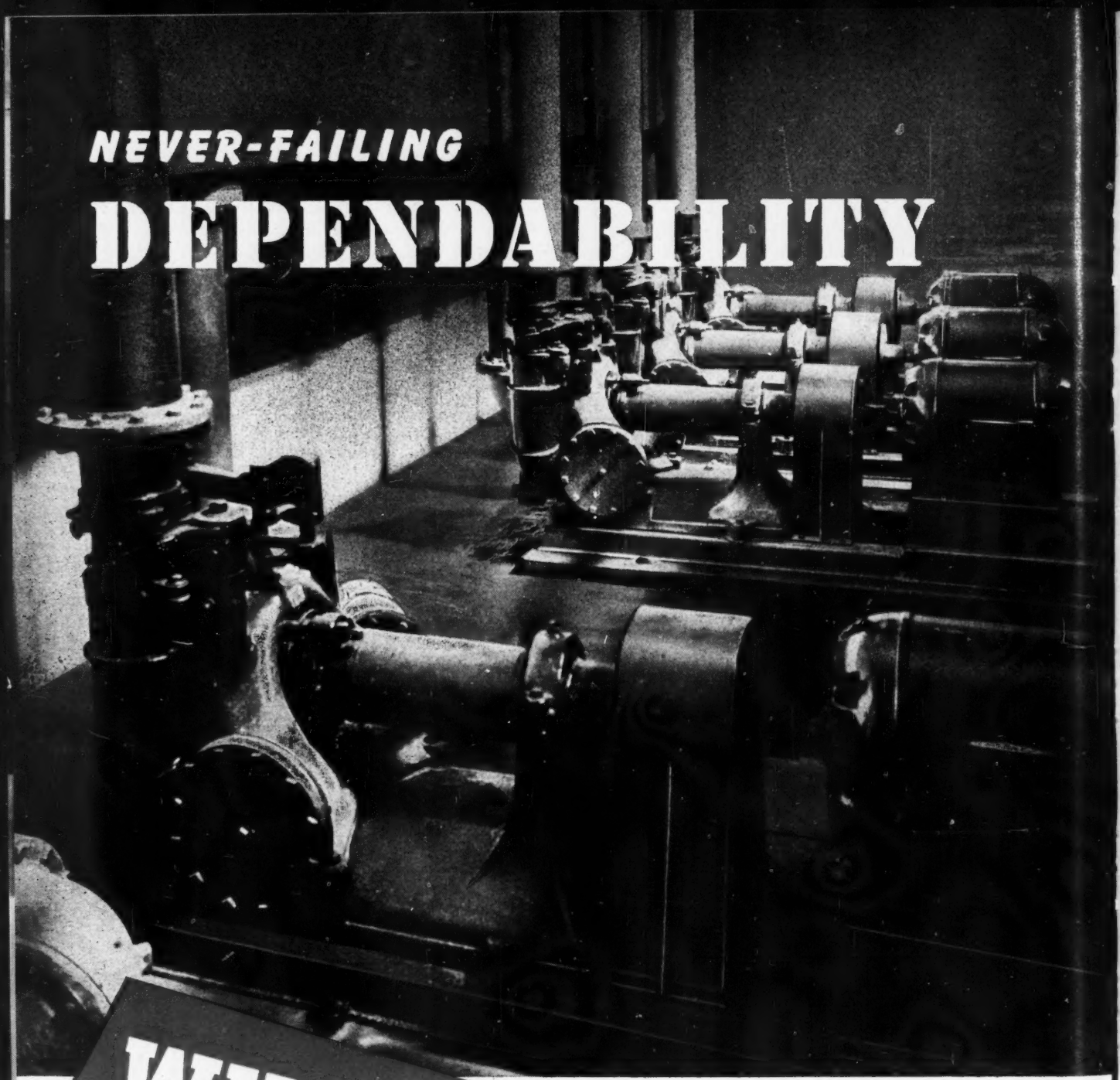

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ENGINEERING AND MINING JOURNAL

H. C. Parmelee, Editor

Recession From Peak Production

IN HIS YEAR-END SURVEY of the mineral industries for 1943, based on estimates of the Bureau of Mines, Secretary Ickes reported that production had exceeded that of 1942 by eight percent in value and three percent in volume. Of the estimated grand value of more than eight billion dollars, metallic products accounted for about two and one-half billion, a gain of six percent. Nonmetallic products showed a decline of fourteen percent, dropping to a little below one billion dollars in value. The record includes some phenomenal items, such as an increase over 1942 of more than seventy-five percent in the tonnage production of aluminum, and nearly three hundred percent in the case of magnesium. Quicksilver production, contrary to expectations of a decline, showed an increase of 2,700 flasks, reaching the astonishing total of 53,546 flasks, highest annual output since 1881.

Obviously, such rates of production cannot be sustained, and so it is not surprising to note numerous evidences of recession from this remarkable wartime peak. Having achieved a magnificent war record, helping to turn the tide of battle, the industry must now look forward to diminished activity. Indeed, the postwar era of cutbacks has already begun.

Mr. Ickes noted that three newly completed potlines for aluminum were not put into production last year, and that six to ten more would be closed. Bauxite mining has already been sharply curtailed to bring production more nearly in balance with consumption.

Mounting stocks of quicksilver have been reflected in a drop in price, with other reductions in prospect. It will be remembered that quicksilver was the only metal to escape immediate price control, and that rising prices stimulated the extraordinary domestic production. The price rose from $85 per flask in February, 1940, to $202 in January, 1942, and thereafter settled at about $195–$196, until December, 1943, when it began to sag. In January, 1944, it declined sharply to $170, with lower levels in prospect. Additional evidence of an overabundance of quicksilver is found in the action of Metals Reserve in ending its purchase of the Canadian output and in curtailing its buying of foreign as well as domestic production.

Other straws in the wind are found in official actions of the War Production Board, relaxing earlier restrictions on the use of certain metals. With production and importation of cobalt exceeding requirements, the metal may now be sold without special allocation. Supplies of molybdenum are sufficiently ample to warrant removing the restrictions on sale and delivery of the mineral. Controls on vanadium have likewise been liberalized, and orders relating to tungsten revoked.

None of these actions should be viewed with alarm, although they should all be regarded as evidence of a necessary retreat from the excesses of a war economy to a more normal state of affairs. They represent the beginning of a natural effort to put our mining house in order in preparation for a gradual return to peaceful pursuits. Other similar steps will be anticipated by prudent mining executives.

Year of Labor Crisis

FRIENDS OF LABOR, among whom we wish to be numbered, must be sobered, if not deeply disturbed, by labor's wartime strike record recently reported by the Bureau of Labor Statistics. Comparing the figures for the months of November 1943 and 1942, strikes numbered 300 and 144, respectively; number of workers out, 500,000 and 53,481; man-days lost, 2,825,000 and 128,164. Apparently labor's solemn no-strike pledge went into eclipse as the memory of Pearl Habor faded with the passage of time. A notable exception must be recorded for Mine, Mill, and Smelter Workers Union.

But it is not merely the record of November or any other month that gives cause for concern. It is the attitude of labor and some of its leaders toward the national safety and welfare, their threat to handicap our fighting forces and cripple the war effort, their apparent indifference to everything save their own interests, their determination to escape sacrifice. These are the unhappy

elements of a condition at home that must yet be remedied just as surely as we are now trying to make the world a place where good will prevails among men.

Reviewing events on the home front, one cannot help noting the tragic parallel between recent acts of labor and the lawless aggressions of Axis leaders. After Japan had moved into Manchuria and had set up a puppet state without incurring so much as a reprimand, Mussolini naturally felt free to despoil primitive Ethiopia. And why not? No international force, moral or physical, was exercised to restrain him. Thereafter it was a simple matter for Hitler to terrorize Europe until the Russians stopped his mad career. For Japan, substitute John L. Lewis; and for Italy and Germany, read railroad employees and steel workers, and you have part of the parallel. And just to make it complete, let it be recorded that a supine Administration not only lacked the political courage and stamina to invoke restraints, but undermined the authority of one of its own agencies, and otherwise paid a heavy price for temporarily averting disaster.

This disorder and lack of authority on the home front are no more tolerable than in the international sphere, and must just as surely be reckoned with some day. Mr. Roosevelt may temporize and tinker with our faulty labor relations policy, but the time will come when we shall have to face the facts and deal honestly with all the people impartially. Genuine friends of labor will speed the day when an equitable, honest, foursquare labor policy is enacted into law and administered in a forthright manner. We commend to intelligent labor leaders Thurman Arnold's vigorous advice as a friend of labor, published in the November issue of *Cosmopolitan* and condensed in the current number of *Reader's Digest*. It is a timely warning against the continued indulgence in lawless excess and aggression that made 1943 a year of labor crisis.

Postwar Technology

TECHNOLOGY lightens the burden of the accumulating handicaps of Nature, a Bureau of Mines investigator wrote in prefacing a report on one of the Bureau's economic studies. This is an exalted way of saying that technology makes it possible to keep on mining ores of declining grade and to find ways of working materials which have never been considered ore at all, and of extracting their metals. More tersely, we say, "Technology reduces costs," and, when the way gets rougher, this becomes "Costs must come down," and we look to the technologist to achieve this objective.

With this as preface, we introduce the second set of articles of the series "Postwar Outlook for Mining," which began with the economic discussions published in the December issue. These articles, which start on page 68, deal with the outlook for postwar technology in mining, milling, and smelting, respectively. Here is no crystal-gazing on the part of the several writers, but rather the result of an effort to discern trends from available facts and to point out opportunities for improvements in practice and reducing costs. Best postwar practice must be an outgrowth of best current practice.

Stockpile Legislation—Strength or Weakness?

THE MINERAL STOCKPILE bill now pending in Congress is really a combination of four legislative proposals, which we greatly fear are handicapping rather than assisting one another. These issues are: (1) mineral stockpiles for a future national emergency, (2) withholding of government surpluses and scrap to prevent postwar demoralization of the industry, (3) averting disaster for marginal producers who were encouraged to aid the war effort and who may still be "in the red" when the emergency use for their output is over, and (4) postwar subsidization of domestic production of certain minerals.

Proposed separately as government policy, these issues would obtain quite different lines of support and opposition within the mining industry itself. Were passage as legislation dependent on the industry alone, to tie them together would be a source of strength, because parties at interest would accept what they objectively disapprove in order to gain what they greatly desire.

However, what would be a source of strength among those vitally interested is likely to be a handicap in Congress, most of whose membership has no consuming interest in mining. A diversity of attitudes toward the separate issues is more likely to multiply opposition than support, and jeopardize the chance of passage. We suggest that each of these issues be written into separate bills so that each can be presented on its own merits.

HISTORICAL SUMMARY: ENGINEERING AND MINING JOURNAL was founded in 1866 as the *American Journal of Mining*, the title being changed in 1869. The following publications have been consolidated with *Engineering and Mining Journal: Coal and Iron Record* (1875); *The Mining Review* (1877); *The Polytechnic Review* (1879); *Mining and Metallurgy* (1902); *The Mining Magazine* (1906); *Mining and Engineering World* (1917); *Mining and Scientific Press* (1922); *Engineering and Mining World* (1932). All rights to foregoing titles of consolidated publications are reserved by the publisher. . . . . The following have served as editors in chief of *Engineering and Mining Journal* and its predecessor publications: G. F. Dawson (1866-67); R. W. Raymond (1867-74); R. W. Raymond and R. P. Rothwell (1874-89); R. P. Rothwell (1890-1901); D. T. Day (1901-02); T. A. Rickard (1903-05); W. R. Ingalls (1905-19); J. E. Spurr (1919-27); A. W. Allen (1927-33); H. C. Parmelee (1933—). . . . . The Editorial Staff of *Engineering and Mining Journal* comprises: H. C. Parmelee, editor; A. H. Hubbell, managing editor; Evan Just, Robert H. Ramsey, and John B. Huttl, associate editors; W. N. P. Reed, assistant editor; H. H. Wanders, market editor; G. J. Young, consulting editor.

Censorship Relaxed on Statistics

CENSORSHIP REGULATIONS were eased during December, making it possible to resume publication of the statistics of a number of vital war materials, notably copper, lead, and zinc. This liberalizing step was taken because the supply situation in the major non-ferrous metals has shown steady improvement for more than a year.

Figures now available for publication, and produced herewith in condensed form, reveal only part of the story. The United States has supplemented its large domestic production of copper, lead, and zinc by drawing heavily on foreign sources for all three metals, either as metal or concentrate. The foreign statistics are not included in full in any of the domestic figures. Also, stockpile statistics are not available for publication, and these must be reckoned with in appraising the published figures. In both copper and lead, stocks shown cover industry figures only. Stocks of zinc are more complete, showing supplies stored by producers for account of the Metals Reserve Company, but the stockpile position is not completely divulged.

Copper production in 1943 was at the rate of 99,632 tons of crude a month. This compares with 93,682 tons a month in 1942. The record output for the year would undoubtedly have been even larger had labor shortages at the mines been overcome completely. During 1939, domestic production of crude copper was at the rate of 69,673 tons a month. During 1943, the United States imported approximately 50,000 tons of copper a month, largely from Latin American sources. The Copper Institute's statistics do show tonnages of foreign copper included monthly in domestic deliveries. The record is impressive, for combined deliveries of domestic and foreign copper averaged 138,875 tons a month during 1943.

Importations of lead from Mexico and other sources have made it possible to entertain a fairly comfortable feeling about the statistics of the industry. Domestic consumption of lead averaged between 65,000 and 70,000 tons a month throughout the last quarter of 1943. Deliveries of lead produced by domestic refineries averaged hardly more than 45,000 tons a month in the same period. The difference between deliveries by domestic refineries and total consumption was made up of lead produced outside of the country.

The zinc statistics enjoy the reputation of being somewhat more realistic than those issued for copper and lead. Production of slab zinc covers all metal produced by domestic smelters reporting to the American Zinc Institute. The figures cover zinc made from foreign and domestic concentrates. Deliveries include export shipments. Moreover, the stocks on hand embrace metal produced in this country and stored for account of Metals Reserve Company. The stock of 159,853 tons on hand at the end of November compares with 68,268 tons on hand at the close of 1942, and comes close to revealing the total tonnage of slab zinc stored in this country.

United States Slab Zinc Statistics

All Figures in Tons **(American Zinc Institute)**

	Production	Shipments			Stock
		Domestic	Exports	Total	
1939.....	538,198	598,972	.....	598,972	65,995
1940.....	706,100	674,615	88,165	762,780	17,582
1941.....	863,955	751,276	106,195	857,471	24,066
1942.....	929,770	733,918	151,650	885,568	68,268
1943					
Jan.....	83,870	66,925	10,296	77,221	96,107
Feb.....	76,667	66,552	8,210	74,762	98,012
March.....	83,787	66,111	9,922	76,033	105,766
April.....	81,057	73,131	5,650	78,781	108,042
May.....	82,399	75,225	4,201	79,426	111,015
June.....	78,865	68,271	5,920	74,191	115,689
July.....	80,249	67,549	3,229	70,778	125,160
August.....	79,736	68,953	2,857	71,810	133,086
Sept.....	79,361	68,180	980	69,160	143,287
Oct.....	83,066	69,845	2,101	71,946	154,407
Nov.....	80,579	73,364	1,769	75,133	159,853

Note: Includes zinc stored at smelters and smelters' warehouses for account of Metals Reserve Company.

United States Copper Statistics

All Figures in Tons **(Copper Institute)**

	Production		(a) Deliveries,	(b) Stocks
	Crude	Refined	Refined	Refined
May, 1942.....	101,683	98,632	134,079	77,383
Jan. 1943....	97,590	97,068	136,007	54,756
Feb. "	92,707	98,203	132,459	51,539
March "	102,329	105,172	146,488	66,189
April "	99,300	97,146	150,451	65,829
May "	105,227	99,103	137,739	58,899
June "	100,313	102,126	138,713	55,707
July "	100,456	105,589	129,631	55,097
August "	97,413	100,077	147,135	53,726
Sept. "	98,867	98,333	141,111	45,844
Oct. "	102,589	97,274	129,212	47,148
Nov. "	99,165	102,136	138,677	52,231

(a) Includes deliveries of foreign copper for domestic consumption. (b) Industry and non-industry stocks; stockpile copper not included.

United States Refined Lead Statistics

All Figures in Tons **(American Bureau of Metal Statistics)**

	Production			(a) Shipments	(b) Stocks
	Domestic	Secondary & Foreign	Total		
1939.....	462,213	35,778	497,991	555,074	58,777
1940.....	480,894	104,586	585,480	603,143	40,926
1941.....	527,503	107,385	634,888	655,542	20,185
1942.....	529,226	104,592	633,818	618,947	34,937
1943					
Jan.....	40,575	3,828	44,403	45,184	34,146
Feb.....	39,800	6,648	46,448	42,456	38,132
March.....	40,363	6,036	46,399	49,431	35,095
April.....	38,238	2,896	41,134	47,035	29,186
May.....	37,836	5,758	43,594	49,031	23,739
June.....	34,963	6,354	41,317	44,607	20,438
July.....	42,137	3,359	45,496	42,007	23,921
August.....	41,239	3,238	44,477	40,202	28,189
Sept.....	42,806	2,021	44,827	43,825	29,184
Oct.....	42,525	1,358	43,883	45,956	27,104
Nov.....	44,418	6,030	50,448	49,548	27,996

(a) Foreign refined lead not included. (b) Does not include lead stockpiled for account of Metals Reserve Company.

How Anaconda Trains New Keeps Supervisors on Their

LESTER F. BISHOP, *General Production Foreman, Anaconda Copper Mining Co.*

To run a mine, you need miners, men who know how to drill a round, timber a raise, bar down the back; men who can work fast but work safely.

But what if you can't get miners?

Then you take blacksmiths, garage mechanics, or whatever you can get and make miners out of them. You have to, and you can if you have to.

Anaconda Copper Mining Co. is doing it at Butte. Here's how they made a miner out of Joe Gardella, ex-soldier. Joe is entirely fictional, but the methods are real — and they work.

Introducing the Man to the Job

THINGS MOVED PRETTY FAST for Joe Gardella in the three months since he had left a Red Lodge, Mont., coal mine for the Army. First, there had been the confused weeks of adjustment to Army life; then there had been the long routine of basic training; then one day there had been the interview with the C.O., who had told him that men with experience like his could do more for the country in the copper mines than they could in the Army. That's why Joe and 38 other soldiers landed in Butte, Mont., about 11:30 one morning a few months ago, ready to go to work for Anaconda Copper Mining Co.

The big question in Joe's mind as the Anaconda representative rounded the boys up at the station was how he'd get along in a copper mine. Mining coal is one thing, mining copper definitely another. Joe, to tell the truth, was a little worried about how he'd fit into this new activity. He continued to wonder about it through the lunch the company gave him and through an interview at the company's Labor Bureau in which he told about his coal mining experience.

Joe would have been quite surprised if he'd known how accurately the company had already diagnosed this question mark in the minds of men like him and how adequately they had prepared an answer for it. The fact is that from the time Joe stepped off the train in Butte he had been traveling a course planned by Anaconda in most painstaking detail to transform him into a good hard-rock miner and a safe one.

First of all, Anaconda decided that Joe had better go into his new job with his eyes open and a picture in mind of what goes on down underground. To that end the company has fixed up a Mining and Safety Exhibit to give Joe, and other job rustlers, a good look at a miner's life before signing on.

With a registration slip from the Labor Bureau in his pocket, Joe went over to the Pennsylvania mine, where he found the Exhibit building located in a clear, graveled yard near the shaft. He was greeted by a short, stocky, smiling Irishman, named Doran, who, dressed in miner's digging clothes, was talking with a group of young fellows outside the building. Doran introduced himself as the demonstrator in charge of the exhibit, took Joe's slip, and introduced Joe all around.

Joe met Axel Helgesen, of International Falls, Minn.; Jack McGrath, of Grass Valley, Calif.; and Willy Sarkinen, of Iron River, Wis. Jack and Willy, according to Doran, are hard-rock miners, but Axel knew even less about copper mining than Joe. Incidentally, Doran, who went fishing regularly before the war came along and knows the Red Lodge country, introduced Joe as the champion fisherman of Bear Creek, which made Joe feel almost at home, and also launched Doran into a humorous fishing story. He was interrupted at intervals by the arrival of several more embyro miners of assorted ages, weights, and backgrounds, and, winding up his story amid a general laugh, Doran looked at his watch and said they might as well get started.

In a conversational tone, as though continuing his story, Doran told them what the exhibit was for. "Some of you fellows, like Jack and Willy here, are miners and know pretty well what to expect underground, but the rest of you, Joe and Axel and Sundstrom there, maybe don't know a copper mine from any other hole in the ground. Well, that's no disgrace, but before we start spending good money to teach you what a muck stick is for, we want to be sure you know the ropes.

"We've got this thing fixed up here

Miners, Joes

to show you everything we do underground, and I'm here to explain how we do it. You follow me around and listen and ask questions, and when we get through, you go and think it over. If you still want to help us get the copper for those planes that are going to bomb Tokio, why, fine; but if you don't, or if there's any doubt in your mind, why the road's open before you and there's no hard feelings behind. You can take it or leave it, and that's no $64 question either. Got that straight? O. K. Now, then, over here is the Bulletin Board just like it is in every mine yard in camp. Look at it every time you come on or off shift, because ——," and Doran went on to explain why.

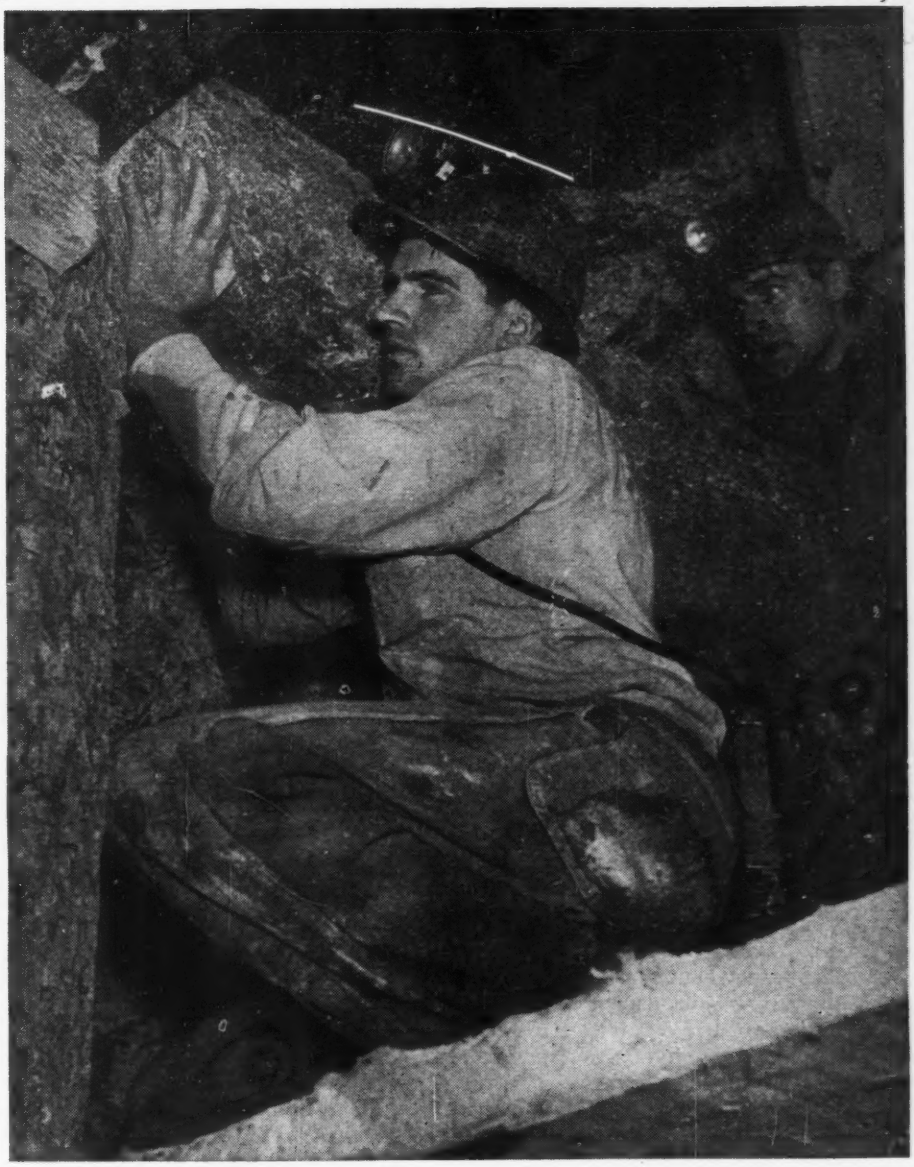
Leaving the board, Doran showed the boys his miner's clothes, piece by piece, and explained why he wore what he did. By graphic illustration he pointed the moral of wearing hard-toed shoes and safety helmets.

Inside the building, Doran gathered the boys around a model of a Butte mine, showed them how a shaft is sunk, how drifts are driven, stopes mined and timbered, and how ore is hoisted out of the mine. He told them how the ore lies in the ground and showed them samples of ore and of the barren Butte granite. It all came a little fast for Joe, but he was interested. This was real stuff. Boy, what the inside of the Butte Hill must look like!

Drilling Explained

From the mine model, the group went on to a section of a mine drift where Doran explained, mostly by doing, how a drifter is set up to drill a round, how the holes are spaced, and how drill shanks and bits are handled. Then Doran told them about loading and firing the round, and showed them how to fix a primer and how to bunch and spit fuses.

Following an imaginary blast, he showed them how the working place is ventilated and then mucked out with a mechanical loader. This loader interested Joe, who had just been learning to run a Joy loader when he left Red Lodge. He watched Doran with the loader, and suddenly asked, "Say, can I try to run that thing?"



ANACONDA'S CLASSROOMS for training miners are special "student stopes," wherein green men get practical instruction, learn to do the job before tackling real production. Setting a cap in the Anselmo are student miners, Carl Kennedy (front) and Frank Sopko

Amused, Doran showed him where to stand and how the controls behave. "But beyond this," Doran said, "you'll have to take the rest of it down the mine. It's against the rules for the men to run this equipment. Not that it's any better than what's down the mine—in fact, it's just the same—but we can't give individual instruction right now and make the schedule. Sorry, Joe, but you'll get plenty of chances to run it later on."

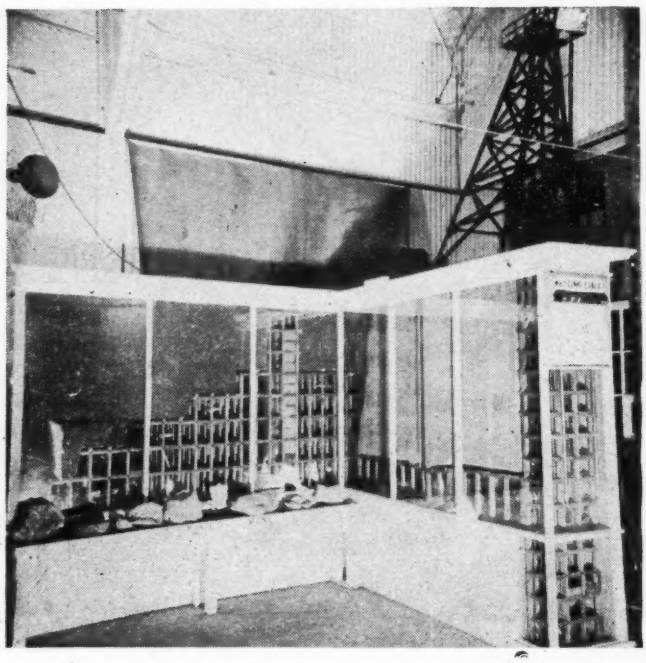
Then Doran went on to show them how a round is drilled with a stoper, how the holes are placed, and how the drill is handled and lubricated. Then he showed them how the rock is handled after breaking, and finished up with the mine signal system.

Then Doran took them all outside to show them a mine motor and a train of ore cars and timber trucks. He filled a car from a chute, explaining how to protect oneself while doing so, and showed them how to couple and uncouple cars without losing a hand in the process. Rapidly then, he ran through the different types of timber and what each is for, and showed them mine ventilation doors set up near by, and explained why they are necessary in the mine.

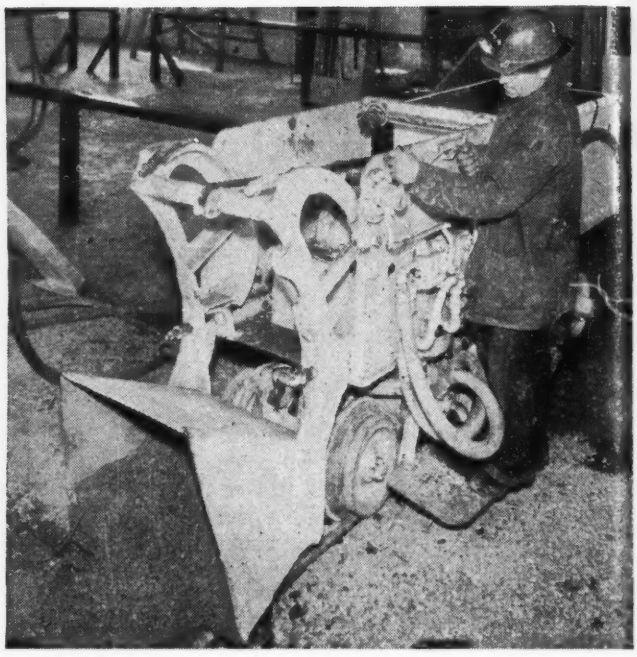
"Well, that's the works, boys," he said at last. "Any questions?"

"Yes," said a hungry looking individual in back of Joe, "How much do they pay here?"

"The minimum wage here is $7.75 a shift," answered Doran, "so that's what you'll get. But don't think you're worth it. If Joe, here, (Joe shuffled his feet and looked off at East Ridge) goes



IN THE MINING AND SAFETY EXHIBIT, applicants for miners' jobs with Anaconda learn, before signing on, what to expect in underground work. A model shows what a Butte mine looks like



MUCKING WITH A LOADER is demonstrated by the instructor in charge of the Mining Exhibit, who also shows the visitors proper drilling, blasting, slushing, and mine ventilation methods

to work for us, we know that he can do about $4.25 worth of work a day. The company has kept track of enough new men to know that. The extra $3.50, they hand you for being willing to learn. Some day, if you're worth more than $7.75 you'll get it. That's just the minimum. Any more questions?"

There were several, and Doran answered them quickly, competently, and with an occasional touch of humor. Joe thought to himself that he could work for a guy like that.

Doran wound up by saying, "Now then, if you want to work with us, go back to the Labor Bureau with your slips, which I'll sign for you, and they'll tell you where to report. Maybe Jack and Willy can pitch right in on contract, but the rest of you will go to work in what we call a Student Stope. When you work there, all you have to do is learn the job. Nobody will be pushing you to get rock in the box. When we think you're ready to start in on your own, we'll let you know. But, if you don't want to work with us, O. K. too. Well, I'm glad I met you. So long, and come see me again sometime."

Doran signed the slips and the group broke up. Joe hung back. "Say," he asked Doran, "doesn't all this cost Anaconda a lot? Seems like a lot of dough just to show us punks what it's all about."

"Yes, it does," said Doran. "About $1.50 for each man who comes here. Since we started this thing in September, 1942, nearly 3,000 men have been through it. About half of them were men from the Army and about two-thirds of them are still with us."

"Well if I can cut it, I'll be with you, too," said Joe.

"You'll cut it all right," said Doran. "I know the signs."

Nine Weeks in the Student Stopes

HIS MIND MADE UP, Joe Gardella didn't waste any time. Back at the Labor Bureau, the man told him to go see the hiring foreman at the Anselmo mine, which Joe did. After answering all sorts of questions about what he'd studied in school and where he'd worked, Joe got an O. K. from the foreman and bright and early one morning a few days later he tramped up the hill to the Anselmo, ready for work.

At the mine gate the guard directed him to the dryman, who assigned him a locker in the change house and told him to change and then report to the timekeeper and the shift boss.

Uncomfortably conscious of the squeaky newness of his clothes, Joe walked toward the group of miners gathered about the headframe and was wondering which of them was Lyford, the student training foreman, when he felt a hand on his arm and a pleasant voice said, "How's she goin,' Bud?" Joe turned to meet Lyford, himself, who went on, "That thin fellow over there is Calhoun, your boss. Come on over and report to him now because he's expecting you."

Lyford introduced Joe to Cal Calhoun, his shift boss, a thin, wiry man with obvious years of experience and a blunt but kindly way with the men, and to Abe Thomas, a smaller man than Cal but very capable-looking, who, Lyford said, was to be Joe's instructor. Abe took him over to the lamp window and got him an electric lamp like the one Doran had demonstrated at the exhibit.

Taken into the group in this way, Joe felt better. Just then Lyford brought over a blond young giant of a Norwegian in whom Joe recognized Axel Helgeson, who'd gone through the Mining Exhibit when Joe did. Axel's clothes looked as painfully new as Joe's, and he seemed even more uncertain. Joe had just begun talking with him, when Cal suddenly said, "O. K. gang; let's go," and there was a general movement toward the shaft.

Joe's stomach immediately wound itself into a knot, and he hoped he didn't look as scared as he felt. He looked up at the decks of cages, the

OUTSIDE THE MINING EXHIBIT, ore chutes, haulageways, and ventilation doors are set up just as they are underground. Importance of each of these elements in mining operations is explained by the instructor, and ore and timber trains are operated to show how materials are handled in the mine. Safety of workmen is stressed in all of these Mining Exhibit demonstrations

headframe above, its safety flag just touched by the first yellow light of the sun, and he gulped a little. That patch of sun looked awfully good to him.

He entered the cage, Abe at his side. "Face the same way as I am," his instructor said quietly, "and while you're going down swallow now and then; it'll make your ears feel better."

Joe was opening his mouth to tell Abe he'd been underground before when the whole works seemed to drop out from under him. This was different from the easy ride into a coal mine entry and it seemed minutes before he caught up with the cage again.

Now they were descending smoothly in a great rush of air, interrupted regularly by a flap-flap as they passed the level stations. Joe realized that a new atmosphere had closed around him. The air was warm and damp, full of a thick, moist earthiness that grew out of the rock itself. In time Joe came to like this peculiar flavor of the underground and to feel comfortable when he was immersed in it.

Primary Instruction

Down at the station, where the cage stopped to let them out, Cal called Joe, Axel, and three other men over to one side. "Before we do anything else," he said, "I want to get you men straight on what there is ahead of you." Grinning, he went on, "So, we'll now go to our conference room and talk it over. Follow me and watch your step."

Cal led them to the back of the station, where there was a clear area out of the way of traffic, and showed them the rules and regulations posters hanging about, the first-aid boxes, and the mine signal bells. He told them to watch where they were going when traveling underground, not to travel without a light, and to get to a safety zone when meeting a train of cars along a haulageway.

"We'll start out by putting you fellows with crews of students who are a little farther along than you are. Each one of these crews is run by one of these instructors here, and they'll tell you what to do. Remember you're here only to learn, not to get out production. We don't care, just yet anyway, if you don't get out a pound of ore in a whole shift, as long as you do learn something about the job you're on, and learn to do it right.

"And paste this thought right in your hats. Don't ever do anything down here unless we tell you, or unless you've studied it and know you're doing right. Don't take chances in order to get a job done quicker. Watch what you're doing all the time. The safest way is always the quickest way.

"Remember, follow directions, take it easy, ask all the question you can think of, and everything will be O. K. I'll be around every so often to see how you're doing. Helgesen, Blake, and Jones go with Smith. Gardella and Freeman go with Thomas. That's all for now, boys, and good luck to you."

"Let's go," said Abe to Joe. "It's a bit of a hike to the place." And off he went, Joe and Freeman after him. Bill Freeman, Joe found out later, had been on the job several weeks.

Leaving the station, they proceeded along the haulageway, the only lights now the ones on their hats. This part of the trip wasn't so strange to Joe, and as they traveled along, Abe showed the tool house, the timber station, the powder and fuse house, and the water car.

Into the Stope

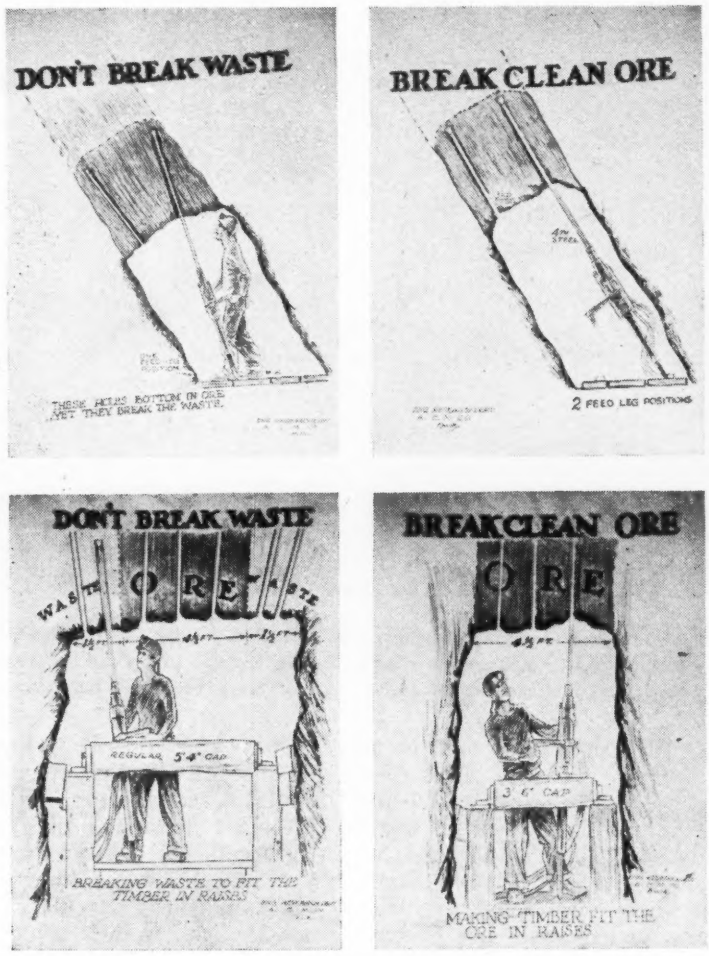
Then they turned into a side drift and wound up at a hole going down off to one side. "You'll need timber," said Abe, "so now's the best time to take it down with you. Hang up your buckets and jumpers here unless you want to eat lunch down in the stope."

Joe put his jumper and bucket along with Freeman's.

"Now, Bill," Abe said, "you can show Joe how to tie up your lagging with the safety hitch and then we'll go down and take it off."

Bill prepared the lagging stock in the safety hitch, and then Joe followed Abe down the ladder that went down the hole. They went down a number of floors until they came to a timbered opening off the manway.

"Keep back out of the way now," Abe told Joe quietly, then tapped the pipeline twice and waited in the clear himself. In a minute or two the pile



GOOD AND BAD MINING METHODS are illustrated by posters prominently displayed in all Butte mines. These supplement regular instruction.

WILLIAM WELLS, a miner for two weeks, sets up his drill in a student stope

of lagging came slowly down the timber slide and stopped on the platform in the manway. Abe gave the pipeline a sharp tap, the rope attached to the lagging went slack, and Abe asked Joe if he could undo the hitch. Joe did, and then the two men passed the lagging back out of the way. Abe then tapped 2-1-2 on the pipe, and the chain which had held the lagging went back up the timber slide, and was replaced by another load of timber attached to the other end of the rope.

After all the timber had been lowered, Abe and Joe went over to the working face of the stope for inspection, where Bill joined them.

"While Bill is barring down the face," Abe said, "Joe, you can connect up the water hose and sprinkle down. We always do those two jobs the first thing after we examine the place."

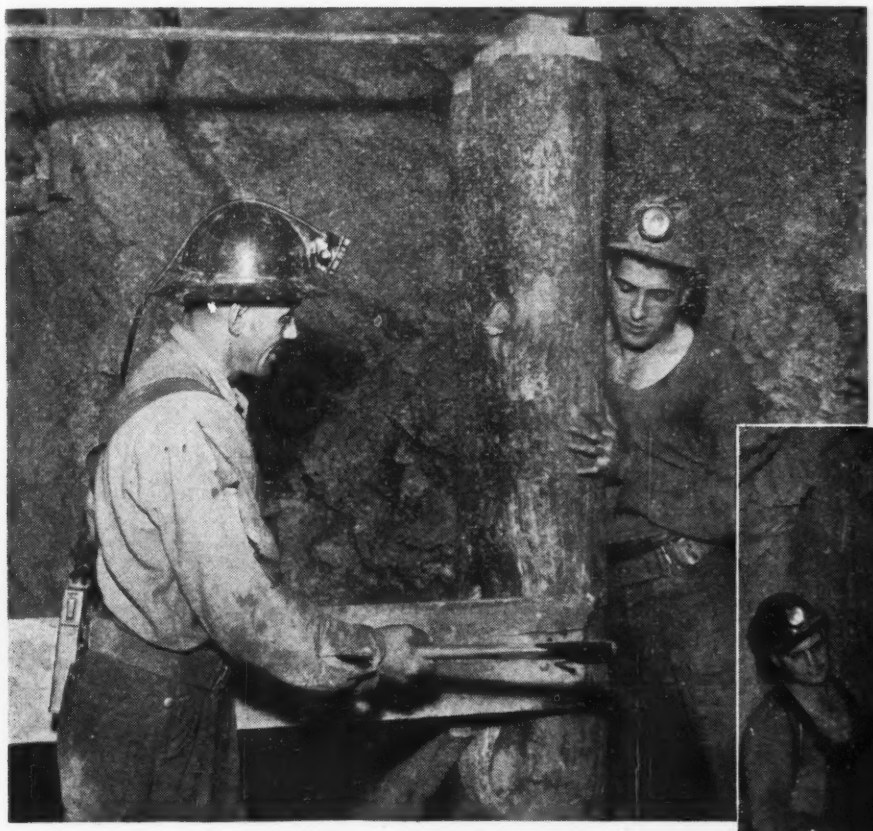
Abe waited until the barring down and sprinkling were completed to his satisfaction and then gave the line-up of work that Cal would probably lay out when he came. First they'd fix floors, then timber, then while Bill was drilling, Joe would be working the broken ore on the lower floor down into the chute.

In this way Joe put in his first day in a student stope in a copper mine. We haven't time, though we'd enjoy it, to follow Joe through all of his adventures in the student stopes of the Anselmo. For the most part, his days were on the pattern of the first one. Abe told him what to do and Joe did it. Time and again Joe started something, only to hear Abe say, "Wait a minute, Joe. Set that down again. Now, there's two ways to do everything, the right way and the wrong way, and pretty near always the wrong way is the hardest or the likeliest to get you hurt. You're learning all this from scratch, so you might as well learn the right way first. Now, start over again and take it like this. Isn't that easier?" It always was, too.

As the days went by, Joe worked more and more into the jobs Bill had been doing. Before long they could divide up the work either way with no difference in performance. Finally Bill Freeman went on to another place and Joe got a new partner, Jim Cole, who was just as green as Joe was the first day. After about four weeks in the stope, Joe moved into a Student Drift, and another replacement was made in the stope, Jim Cole taking the machine and the lead, and a new man working into Jim's jobs.

In the drift Joe got his chance to operate the mechanical loader which he had taken a fancy to at the exhibit. At first it bucked and stalled, but under the instructor's teaching it was not long before he could "fan 'er out." Then he went on to the drifter drill, where he rounded out his knowledge of placing the holes where they would count most.

By degrees Joe worked into a routine that began to approach an acceptable standard. One by one he had done all the various jobs in stope and drift, and even tackled some special jobs brought on by small emergencies. One day Cal, the shift boss, told Joe and his partner that he was putting them in a different stope where they would be on contract against regular miners on the opposite shift. This



SETTING UP TIMBER is part of the training in the Anselmo mine. William Warren (right) and Ernest Simon stand a cap and lace it to a rigid set with lagging which will later form part of the support for a platform

A MECHANICAL LOADER is run by Harold Peterson, student, while Monroe Dunfee, instructor, coaches on the sidelines. Peterson is specializing in drift and crosscut work, a procedure at times encouraged by Anaconda to produce expert specialist miners rapidly

graduation from the Student Stopes, they found, meant a change in their working routine. Heretofore they had worked along from day to day with no regard for the point at which quitting time might find them. They had merely picked up the work again next day and gone on, but now they faced a coarsely critical night shift who might be expected to be unsympathetic with work done sloppily or left undone. Therefore they began to pour it on.

Cal helped them a lot. All the shortcuts he knew, all the legitimate time-savers he'd gathered in 30 years of hard-rock mining, he passed along to them. Gradually they hit a stride that put them in cycle with the night crew. In the stope it was break and slush, or break, timber, and muck; and in the drift it was round in and round out on each shift; a cycle complete in each shift to leave the place ready for the next crew. In short, they had become miners, not the best of miners, perhaps, but adequate workmen and, what is of great importance, safe, careful workmen. The patient thorough instruction Cal and Abe gave Joe during his nine weeks in the Student Stopes served its purpose well, and Joe is now doing a good job, and what's more, he enjoys doing it.

On-the-Job Training in Methods and Safety

THE FACT THAT Joe Gardella left the Student Stope as a graduate miner, and is now out on his own, does not mean that the Anaconda management has lost interest in him. For one thing, Joe now represents an investment on their part of about $300, which is about what his unhurried course of instruction has cost them, and, management being what it is, they'd like it back. For another, the better miner Joe becomes, the better will be the balance sheet of the mine Joe works in. Therefore, a record of Joe's activities has been kept from his first day in the Student Stope, and Joe's instruction goes right on, though not as obviously or as intensively as in his student days.

Joe's on-the-job training consists of all the instruction and training given by his new shift boss as the work progresses. He is placed with a more experienced man and given every opportunity to absorb all the mining lore he can hold. Uncle Sam has a hand in this, too, with the government's Training Within Industry Program, the principles of which are constantly applied in the Butte mines. Emphasis is continually placed on teaching the men to work correctly, conscientiously, quickly, and safely.

In spite of the difficulties inherent in attempting to coordinate the widespread and diverse activities of a min-

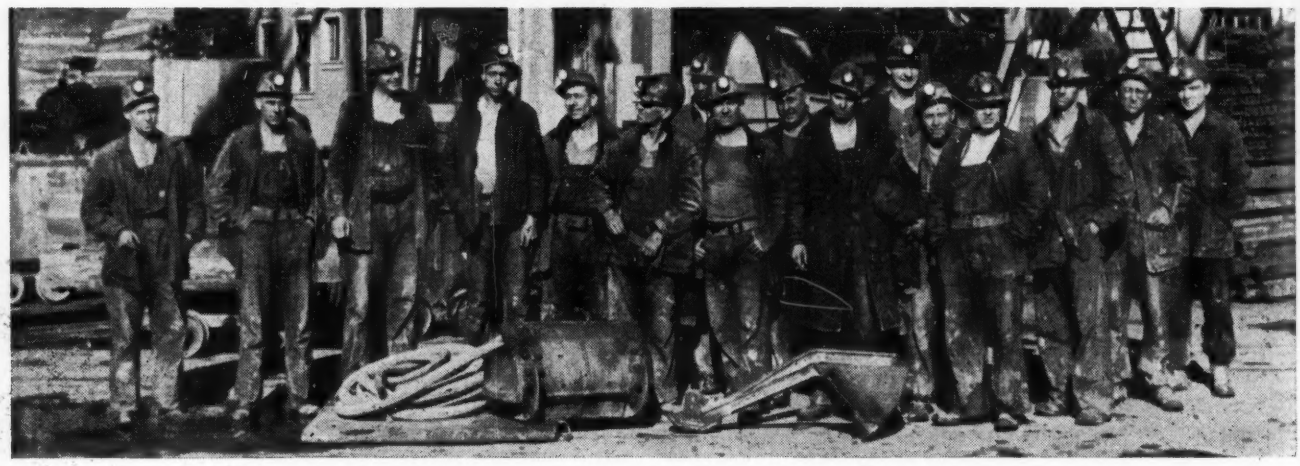
ing operation, Anaconda has made good progress in standardizing most of the ordinary mining procedures. By doing so whenever possible, instruction of new men has been made easier, and widely separated, yet related, operations have been made to work more in harmony. The fact is Joe will go on learning more about his job as long as he works for Anaconda.

In addition to job instruction, stress is constantly placed on accident prevention and first aid. These things are taught through the customary channels of bulletin boards, posters, lantern slides, motion pictures, group training, first-aid team competition among the various mines, and so on. The Anaconda management intends that everyone in the organization shall have first-aid training, and the company seems in a fair way to accomplish that result.

Teams are also trained to cope with emergencies such as fires, sabotage, or air contamination, not only for rescue purposes, but for prevention, if possible, or alleviation of the emergency itself. Men who take this training are listed as "helmet men," and a crew of them is in readiness at each mine at all times. A refresher course is given these helmet men once each year.

Last year, 1,126 men completed the first-aid course and 150 men qualified as helmet men in the mine rescue work. The cost of this program is considerable, because the men are paid overtime rates while taking the helmet training, and equipment must be purchased and instructors paid. All in all, it costs A. C. M. plenty to turn Joe Gardella into a good miner and keep him as safe as possible, but the company has found that it's worth it.

Mining's First "Shift Bosses' School"



Supervisors in the Shift Bosses' School discuss scraper equipment at the Anselmo mine

A MINE can't be run without good shift bosses any more than an army can fight without good top sergeants. Good shift bosses, like good sergeants, must be trained, and Anaconda is training its shift bosses in its own Supervisor's Training Institute, a development entirely new in the mining industry.

Of course, a likely looking prospective shift boss may still be taken off his regular work at intervals and sent along with one of the regular shift bosses to see how the work is done. If he seems to take to it, he may be tried out as a substitute boss from time to time, and if his work continues to look good, he is given a regular beat.

That is the ordinary time-honored way of producing supervisors. One Anaconda refinement of this is in turning a good prospective supervisor over to the mining research department. Here his work consists of pure research involving comparative time studies of various operations, study of operating statistics, devising improved methods, use of new equipment; in short, anything new the operating department can think up for him to try. The result is a shift boss who is fast on his feet and is already familiar with any new method or idea which is adopted for general use in the mine.

Of the 30 men put through this research department course in the last three years, 16 are now supervisors in the operating department, five have become company engineers, one is instructing new employees, one is a professor of mining, one is an engineer in an airplane plant, two are government engineers, and four are in the armed service. Apparently the company picks good men and trains them well.

The mere creation of a supervisor is not, however, regarded as an end in itself; and his training goes on just as does Joe Gardella's. Anaconda aims at developing in its supervisors the following five skills: (1), thorough knowledge of the work he supervises; (2), skill in instructing others in the work he wants done; (3), skill in planning to improve methods and avoid waste; (4), skill in maintaining good human relations; (5), knowledge of his responsibility and of the policies, procedures, and agreements of the company.

To accomplish this task, both on-the-job and supplemental training are used. The on-the-job training involves instruction and follow-up of the daily work by the assistant foreman and other personnel and a sharing of experience and knowledge among the supervisors in the same mine, a process which is facilitated by conferences concerning pertinent problems, and by rotating shift bosses occasionally to give them more experience.

The supplemental training is where the innovations come in. This includes: the Supervisors' Training Institute; government-sponsored job instruction training; accident prevention, mine rescue, and first-aid work; management information (Elliot Service); foremanship conference; and shift boss information bulletins. If any miner thinks a shift boss has an easy time of it, he has only to note that this is piled on the boss's regular duties, and he'll go back to his stope contented.

Locally referred to as "the shift bosses' school," the Supervisors' Training Institute is something new in the mining industry. It developed from the thought that most mining super-

visors, and shift bosses in particular, are often confronted with unforeseen problems which they can solve most effectively only if they have a good understanding of the methods, costs, and objectives of the various operations in which they are engaged.

Following prolonged study and discussion, it was decided to build the Institute around a course of lectures, conferences, inspection trips, and discussions, including free criticism, of the operations inspected. The course was based on fundamental principles, both practical and technical, bearing in mind that about 83 percent of the Butte supervisors who might be expected to take the course were practically trained and 17 percent technically trained.

As it was finally set up, the Institute gives each supervisor a three-day course about twice in 12 months. It involves the same principles of Tell, Show, Do, and Check which are observed in all the training programs heretofore described. It is part lecture, part conference, part underground work, and part discussion.

As a check on the course's effectiveness, it was given originally only to six shift bosses from different mines, the foreman of the student miner training and an operating foreman. These "guinea pigs" went through the course, then submitted their reactions in anonymous questionnaires. All were heartily in favor of it, and the shift bosses requested that their opposite partners be given the same course, so that the two partners would be on common ground in applying the material of the course to their daily work. From this successful launching, the Institute has sailed on most happily.

Two three-day courses are conducted weekly, in each of which 10 to 12 shift bosses, and sometimes other supervisors, are accommodated. The program occupies eight full hours on each day, the men receiving full pay while attending, but being relieved of their regular duties. No more than two supervisors are taken from any one mine, the number being thus restricted so that the flow of mutually new information may be kept at a maximum.

The Institute provides each man with a notebook, which becomes his personal property, containing a part of the course's material in print and leaving blank spaces for the owner's observations. It provides an outline for the course and a convenient memory refresher after the course is completed.

The first course, as outlined in the accompanying program, ran from Jan., 1943, until May, during which time 328 supervisors were put through it. A second course, much resembling the first except that somewhat different subjects are treated from the aspect of maintaining good human relations, is now being completed. Three days seems to be the optimum time per group in the course. At least that much is required to cover the ground, but more time per group lengthens the entire course unsatisfactorily. Various members of the management personnel prepare and conduct the courses.

Of the 328 men who took the first course, 328 expressed a desire to see the program continued. These opinions were expressed in anonymous questionnaires, though some men insisted on signing them. Numerous valuable suggestions were received which will be acted upon next time.

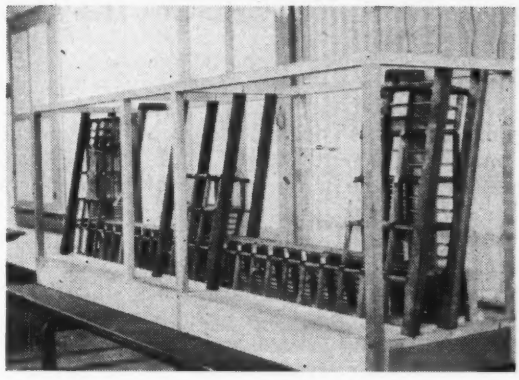
Government-sponsored job instruction training has been given to all supervisors (457 in all) and has been found very helpful. Job methods training is now being given, and job relations training will be given as soon as it becomes available.

Biweekly accident-prevention meetings are held at each mine, at which shift bosses, management, and operating personnel discuss accidents which may have occurred and ways and means of preventing their recurrence. Shift bosses get the same first-aid and mine rescue training given all employees.

The Anaconda management has also subscribed to "Management Information," a weekly news bulletin of Elliot Service, on cost control, practical psychology, accident prevention, organization relations, waste elimination, quality maintenance, self-improvement, and similar subjects.

Summing up the whole thing, it is apparent that right from Joe Gardella way back there at the Mining and Safety Exhibit clear on up to the operating superintendent himself, Anaconda's men are trying to do a better job, and are trying to help their fellow-workmen do that, too.

PROGRAM OF SUPERVISORS' TRAINING COURSE



MINE MODELS serve as discussion subjects in classes of the "shift bosses' school." Problems in mining methods are worked out in small-scale but complete reproductions of real mining jobs

First Day

8:00– 8:30 A.M.—Introduction, get acquainted
8:30–10:00 A.M.—Lecture. Production problems and supervisors' responsibilities
10:00–11:00 A.M.—Conference. Production and cost analysis
11:00–12:00 M.—Lecture. Practical engineering
1:00– 2:00 P.M.—Lecture. Operating cycles
2:00– 5:00 P.M.—Lecture. Mining methods

Second Day

8:00–12:00 M.—Underground inspection of subjects of first day's lectures
1:00– 2:30 P.M.—Conference on operations inspected
2:30– 3:00 P.M.—Lantern slides of mining details
3:00– 5:00 P.M.—Lecture. Mining methods

Third Day

8:00–12:00 M.—Underground inspection of second day's topics
1:00– 3:00 P.M.—Conference on operations inspected
3:00– 4:00 P.M.—Quiz. Problems on lectures
4:00– 5:00 P.M.—Summary and conclusions

THE HEADFRAME of Preston's main shaft stands close to the cyanide plant, on a site a few miles from the heart of Timmins. The company is a neighbor of Dome Mines. The property is the only one in the district, with minor exceptions, to have its ore occurring in the porphyry

Change of Stoping Method Solves Mining Problem

G. G. CAMPBELL, *General Manager, and* W. A. HUTCHISON, *Mine Superintendent*
Preston East Dome Mines, Ltd., South Porcupine, Ont.

AT THE OUTSET of its gold-mining operations in 1939, when Preston East Dome Mines, Ltd., at South Porcupine, Ont., was preparing for stoping, the management of the company was not in a position to know that the orebodies on its property would prove very irregular. On the contrary, it was believed that they could be mined by the shrinkage method. Accordingly, shrinkage stopes were opened on several of them. After these stopes had been carried up a few cuts, however, the discovery was made that, although the ground stood well, the shape of the orebodies, along both strike and dip, was too irregular for this method of mining.

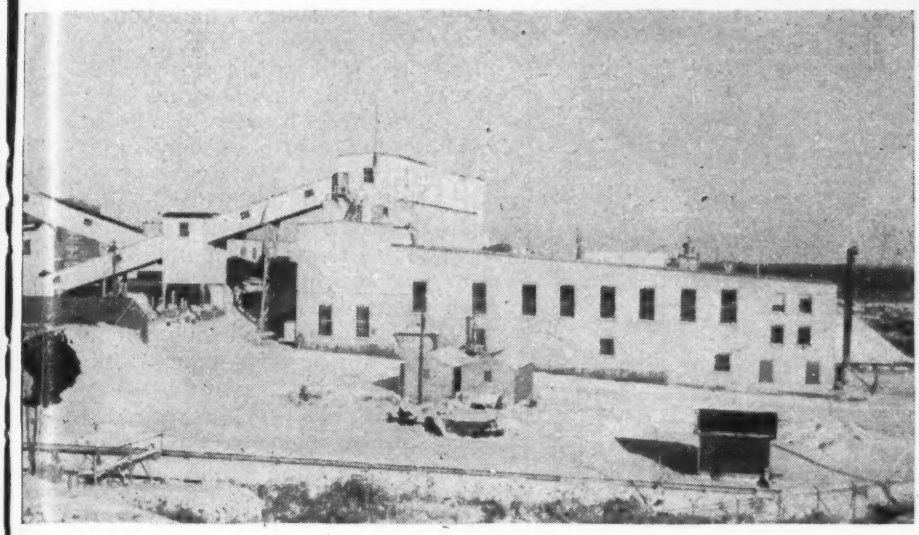
Decision was made, therefore, to mine the wide deposits by the horizontal-cut-and-fill method and the narrow veins by open stull stoping. Shrinkage stoping was to be confined to isolated orebodies that were sufficiently consistent in strike and dip to permit mining by this method. How the problem was worked out is told in this article.

The rock series on Preston East Dome's property is made up of greenstone flows separated locally by narrow bands of tuff on agglomerate. These sweep in from the northwest, dipping about N. 45 deg. E. and curving on the strike gently to the southeast almost to the southern edge of the property, where they turn sharply northeast, here steepening to a 65- to 80-deg. N.W. dip. Numerous bodies of quartz porphyry that conform more or less to this structure have intruded these rocks, varying in size from narrow dikes to large masses up to 900 ft. in width. One of these large masses has produced practically all of the ore mined to date, although minor amounts are found in, or associated with, other porphyry bodies, large and small. The mine is unique in the Porcupine district in that, with minor exceptions, it is the only one in which ore is found in the porphyry. In the others, the ore occurs in the invaded rocks cut by the porphyry.

The main ore-bearing porphyry is about 1,200 ft. long on the surface and strikes northwest-southeast, varying in width from 150 ft. on the northwest to about 600 ft. at the opposite end.

About 75 percent of the ore so far mined has come from large "replacement" zones arising from the footwall contact of the porphyry mass, usually where irregularities in the contact due to minor drag folding or faulting are prevalent. These zones are essentially discontinuous quartz gash veins, very steep, which contain minor ankerite and albite and varying amounts of pyrite, pyrrhotite, chalcopyrite, sphalerite, and galena. Such a zone may extend 200 to 300 ft. laterally and vertically or may be very limited. Gold values are found in the sulphides in the veins or the adjacent porphyry, or in the free state in the veins. The porphyry within and surrounding such a zone is usually highly altered to sericite, carbonate, secondary quartz, and chlorite, and its schisted character accentuated by talc and sericite on the planes of schisting.

The remaining 25 percent of the production has come from narrow quartz-tourmaline veins. These commonly arise from the footwall contact and strike diagonally across the porphyry mass. They dip 65 to 75 deg. on the average but are very irregular in detail. The mineralization is similar to that of the gash veins save for the presence of tourmaline banded with quartz. Spectacular amounts of visible gold are occasionally found. Scheelite sometimes occurs in economic amounts but is ordinarily too widely disseminated to be of value.



Development

Work underground has been practically confined to the Preston porphyry mass down to the 9th level. At this horizon the West porphyry mass is now being developed on the 9th and the 12th levels. This is approximately 2,000 ft. from the main or No. 2 shaft (No. 1 is an air shaft, inclined, 90 ft. deep).

Drives are extended from the shaft to the porphyry mass, which is then developed by drifting from the drives. Generally these drifts are driven close to the footwall, on line. If the porphyry is wide, two or three drifts may be necessary to explore it—on line but not necessarily parallel. The purpose is to explore the porphyry by diamond drilling across the mass. Orebodies so found are opened by crosscuts.

Both drives and drifts are driven 7 x 7½ ft. high on a 0.5 percent grade favoring the load. A drifter drill is used, with a miner and a helper. A 28-hole round with a shatter cut breaks 6 ft. on the average. The round is mucked out by an air-operated Gardner-Denver loader, of which there are seven in the mine (one GD9 and six GD9L). The loader has a two-man crew, which mucks two rounds per shift, there being 27 to 28 tons per round. The ore runs 12 cu. ft. solid per ton and 20 cu. ft. broken per ton.

Development raises are driven for exploration, servicing, and ventilation. They are 5 x 6 ft. in cross-section and untimbered. They are driven on line at 49 deg. because the Ontario Mining Act calls for a timbered manway in any raise steeper than 50 deg. A 21-hole, shatter-cut round, breaking 5 ft., is drilled by a driller and a helper and blasted in one 8-hr. shift. Ladders and pipes are carried up the raise on sprags. The muck is drawn off through chutes into cars in certain cases. In others it is run into the drift and shoveled up with a loader.

This and all other raising is done with I-R R51 stoper drills. The mine has 27 of these drills and 6 Canadian-Pneumatic C.P. 43's.

Detachable bits are used in drilling. The Hayes bit, on ⅞-in. alloy-steel shanks, has recently displaced the regular steel formerly used, consisting of the same ⅞-in. alloy steel with a bit forged on the end. Preston is the only company using ⅞-in. alloy steel for shanks. With the aid of hot-milling, five re-uses are obtained with the Hayes bit.

All raises, generally, are blasted electrically after reaching 50 ft. above the level. Delays are used with 40-percent Polar Forcite dynamite.

Changing From Shrinkage to Cut-and-Fill

The shrinkage stopes that had already been opened in which the change-over to cut-and-fill mining was to be made had been mined up to various heights, ranging from 35 to 65 ft. above the stope floor. They had, moreover, been developed over box-hole pillars, it being only in the narrower orebodies and in the quartz veins that the backs had been taken down and the openings timbered.

In preparing to change to cut-and-fill, the back of the stope, in each case, was thoroughly scaled, and, after this, the muck was drawn. Much of the broken ore had to be scraped to the draw points owing to the flat dip of the orebodies, which averaged about 45 deg., and the irregularities in the footwall.

Once the stope was emptied, a timbered mat was laid on the stope floor over the box-hole pillars to facilitate their recovery eventually. This mat consisted of 10-in. round stringers placed at right angles to the stope length on 5 ft. 4 in. centers and covered with split lagging. Over each box hole 10 x 12-in. bearing timbers of B.C. fir were laid to support the mill hole of the new cut-and-fill, and the mill-hole cribbing was raised to within 8 ft. of the stope back. Fill was then run in through raises connecting the stope with the level above. When the stope had been completely filled, mining was resumed, this time by the cut-and-fill method.

Since the change-over in mining method, it has become standard prac-

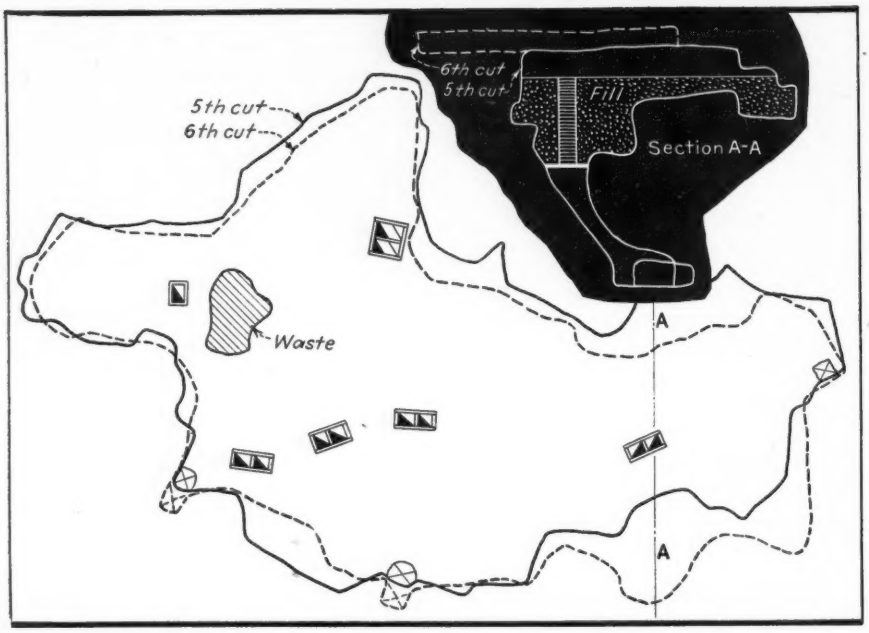
Facts About Preston

Preston East Dome's 280-acre property adjoins on the south that of Dome Mines, Ltd. The first staking was done in 1909, the company was organized two years later, and in 1936 it was revived and reorganized after a dormant period of almost a quarter century.

Exploratory drilling, then begun, was followed by sinking a five-compartment shaft. A 300-ton cyanide plant was built in 1938, went into production in 1939, and has since been expanded as the mine deepened and output increased. It treated up to 1,100 tons per day until wartime labor shortage caused a decline to less than 540 tons per day last August.

Today Preston's five-compartment timbered shaft is 1,648 ft. deep. The bottom level is at 1,550 ft., levels below 300 ft. being 125 ft. apart. The shaft is equipped with 2½-ton skips in balance, two cages, a 48x36-in. double-drum geared electric hoist for handling men and a 98x60-in. double-drum geared skip hoist, both of them Canadian Ingersoll-Rand. There are also two 2,815-c.f.m. Canadian I. R. compressors.

The company is credited with reserves of 900,000 tons of ore containing 0.22 oz. gold and employs 350 men, three-fifths of whom are underground.



THE IRREGULAR SHAPE of many of the Preston mine's orebodies, along both strike and dip, is indicated in the plan view of two successive cuts in the 318-A cut-and-fill stope. The lateral shifting of successive lifts is well shown in the vertical section

tice to develop all stopes over drift timber.

Four Stoping Methods Used

At present 62 percent of Preston East Dome's ore is won by horizontal cut-and-fill stoping; 7.6 percent by shrinkage; 16.5 percent by stull stoping; and 8.0 percent by square-set mining. The remaining 5.9 percent comes from development work.

In the conduct of any mining method the details are important. The procedure at this mine with each of the mining methods used, except shrinkage, is described in the following paragraphs. Shrinkage stoping is conducted in quite the usual way.

Mining by Horizontal Cut-and-Fill

Where a stope is prepared for cut-and-fill mining from the start, the drift walls on the level are first slashed to the full width of the ore and to the 7½-ft. height of the drift. After this the ore broken is mucked out by an air-operated Gardner-Denver loader. This loads into 20-cu. ft. side-dump cars. A horizontal cut is then taken above this, for the entire length and width of the ore to be mined, to a height of 16 ft. above the track. Flat holes 11 ft. long are spaced 2 ft. apart horizontally and 4 ft. vertically. The broken ore from this cut is then mucked out as before.

Drilling is done with wet drifters, mounted on 8-ft. vertical column bars, and Hayes detachable bits, using ⅞-in. alloy steel shanks. The drifters used by the company are principally Gardner-Denver D89 machines (43 in number for all purposes) and Canadian Ingersoll-Rand DA35 drills (10 of them), with a few Climax and Holman machines.

In stope blasting, 50 percent Cilgel (an ammonia powder) is used, as compared with 70 percent Driftite in drifting and crosscutting, and 40 percent Forcite for raising, sandblasting, and blockholing. All shooting is done with No. 6 caps and black taped fuse except in raise work, where electric delays are employed. It is also customary to use wooden spacers and clay stemming in cartridges in loading the holes.

The next step in cut-and-fill mining after the sill cut described has been made is to provide a gangway under the stope. This is done by installing drift sets on the level over the full width of the stope. These sets consist of 12-in. round caps supported on 10-in. round posts and spaced 5 ft. 4 in. center to center so that a 16-ft. length of lagging will cover three caps. The lagging that covers the sets is laid longitudinally and is spiked to the caps. Cushion blocks of 3-in. spruce are placed between the cap and top of the posts.

Different types of timbering may be used in constructing this gangway, according to the area. Where the stope width is considerable, the timbering is limited to a gangway a single set wide with a timbered floor laid between the gangway and the wall on either side. The open space between the walls and the gangway is filled with waste rock.

Loading chutes, one set wide, are built in the timbered gangway sets, on 21 ft. 4 in. centers (that is, 16 ft. apart) and at right angles to the track. Each chute marks the lower end of what will be one of the cribbed mill holes that will be built upward with the progress of the stope for drawing off the ore.

The timber used in this stope-preparation work consists of untreated local spruce and B.C. fir, 10x12 in. or 12 x 12 in., depending on the amount of support required.

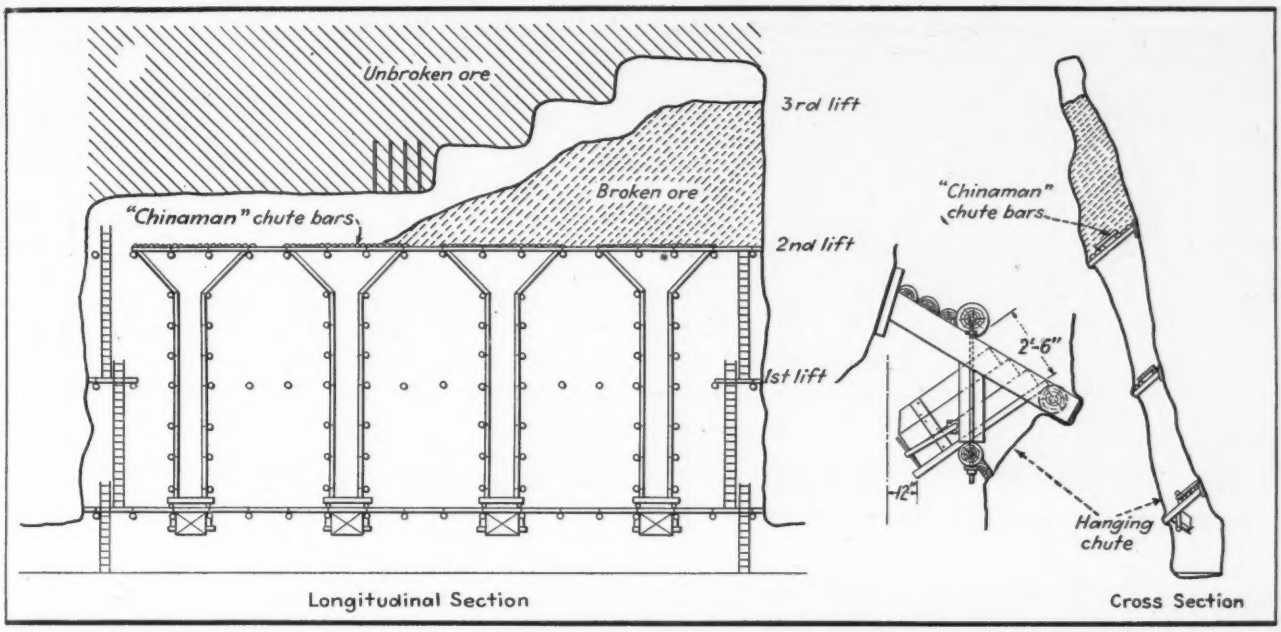
Before stoping begins, the fill raises are located as advantageously as possible for filling the stope as mining proceeds and are put through to the level above. They are driven 5 x 6 ft. in cross-section and, untimbered, they are then slashed to 12 x 6 ft. to accommodate a chute and manway. The drilling is done as described for development raises. The manway is timbered with 10-in. stulls, spaced 4 ft. center to center and lined with split lagging. The stulls are spaced at 4 ft. so that an 8-ft. lagging will cover two posts.

Before breasting is begun, a temporary floor of 2-in. elm plank is laid on the waste rock that has been filled in previously from the fill raise from wall to wall around the timbered gangway. Mining can now begin.

Starting at the fill raise, the ore is mined in cuts 8 ft. high longitudinally with the stope for the full width of the orebody. The ore broken down on to the temporary floor is scraped to the chutes with a 7½-hp. air-driven, double-drum Sullivan scraper hoist, working on 90-psi. air and mounted on 8 x 8-in. spruce skids.

The equipment employed, which is all made in our shops, consists of a 36-in., 485-lb. hoe-type scraper having a manganese steel lip. Both the pull rope and the tail rope are 9 x 16—⅜-in. best plow-steel cable. Recently we have substituted a strand of our 6-19 discarded hoisting rope for this purpose. Seven-inch blocks are used, equipped with swivel-hooks and reclaimable wedge-type eyebolts. The company has 22 of these hoists as well as one 12-hp. Holman double-drum hoist.

This scraping is done backwards as well as forwards and across the stope in a line parallel with the toe of the muck pile, so that the big pieces will

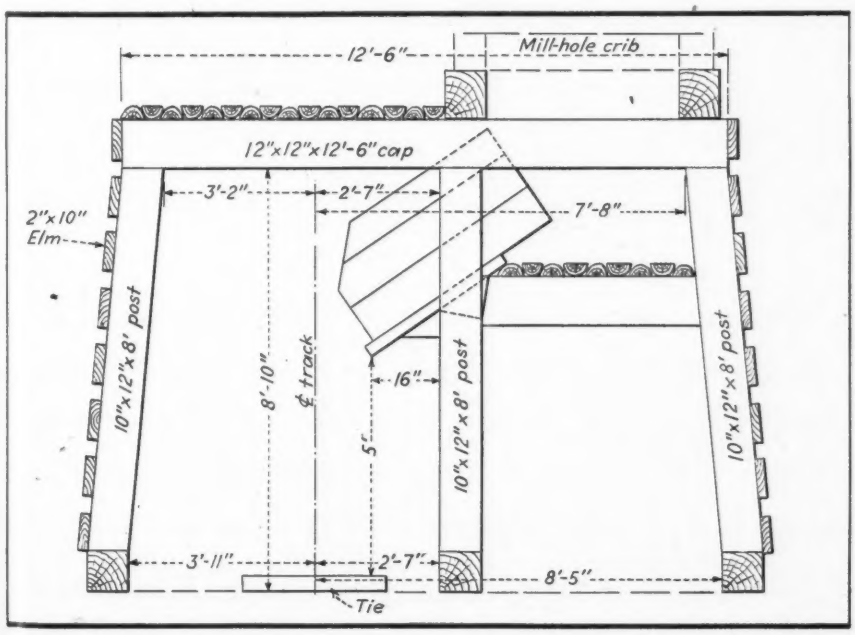


AN OPEN-STULL STOPE, in two sections, such as is used in narrow veins, irregular in dip and strike. The chinaman-chute bars and the hanging chute are shown, with a detail of the latter

roll down the pile on to the stope floor, where they can be broken up.

As the broken ore is removed, the temporary floor is lifted, and the mill-hole cribbing is raised to within 8 ft. of the stope back. Mill holes are built of 8-in. round spruce and are divided into two compartments, one of which is used for servicing and traveling. The inside of the chute compartment is lined with 3-in. elm plank and the outside of the manway compartment with spruce slabs to prevent the fill from running into the manway between the cribbing. Over the top of the mill hole is laid a grizzly of 60-lb. rails spaced 10 in. apart. The ore tends to break large and is sledged or bulldozed here as necessary.

In all the new cut-and-fill stopes in the mine the mill holes are spotted at intervals of 21 ft. center to center. Use of such close spacing where scrapers are being used is due to the irregularity of the ore. Due also to this irregularity, it frequently happens that after two or three lifts the draw-points may no longer be in the right place. Some of the mill holes may have to be abandoned because they have become overhung by the stope wall. It may thus become necessary to go into the footwall and drive box holes or to offset the chutes.



DRIFT SET timbering as used by Preston at mill-hole car-loading chute under a cut-and-fill stope. Elsewhere along the drift the set consists of the two outside posts, battered as here, with an 8-ft. cap, other dimensions being the same

After the cribbing has been raised to within 8 ft. of the back, fill is run in until it is flush with the top of the mill holes. The fill consists of sand run in from the surface after being trucked in from the gravel pit. Such sand must first meet a porosity test to minimize the risk of its becoming hung up dangerously. It is spread with the slusher hoist and scraper, and with hand-trammed 0.75-ton fill cars of United Verde scoop-type design.

When the fill has been run in, the temporary floor is relaid on it in preparation for making the next cut.

The stope is serviced from the mill-hole manway, a single-drum I.-R. Tugger air hoist being provided. There are 14 such hoists for servicing the stopes.

Because of the extreme irregularity of the orebodies, the walls are diamond-drilled on each floor at intervals ranging from 12 to 25 ft., depending on conditions. This is all core-drilling and is done under contract by the Ryan Diamond Drilling Co. About 7,000 ft. of hole is drilled monthly. From this drilling the amount of slashing to be done on this cut is determined. Walls and breast are carefully sampled, moreover, and the back

Direct Stoping Costs, January to June Inclusive, 1943

Aver-Tons Broken Per Month	Tons Per Machine-Shift	Tons Per Man-Shift	Labor							Supplies					Total Direct Cost
			Break-ing	Scal-ing	Scrap-ing	Muck-ing	Tim-ber-ing	Fill-ing	Total	Ex-plo-sives	Tim-ber	Fill	Misc.	Total	
Cut & fill stoping															
11,721	**61**	**6.6**	**$0.28**	**$0.18**	**$0.28**	**$0.03**	**$0.23**	**$0.23**	**$1.23**	**$0.18**	**$0.16**	**$0.34**	**$0.03**	**$0.71**	**$1.94**
Stull stoping															
4,863	**21**	**4.5**	**0.75**	**0.16**	**0.01**	**0.34**	**0.59**	**None**	**$1.85**	**0.29**	**0.22**	**None**	**0.03**	**0.54**	**$2.39**
Square set stoping															
1,493	**40**	**4.3**	**0.39**	**0.22**	**0.07**	**0.54**	**0.62**	**0.13**	**$1.97**	**0.13**	**0.38**	**0.13**	**0.06**	**0.70**	**$2.67**
Shrinkage stoping															
1,206	**35.4**	**5.4**	**0.44**	**0.13**	**None**	**0.36**	**0.20**	**None**	**$1.31**	**0.19**	**0.10**	**None**	**0.02**	**0.31**	**$1.62**

is geologized. The information thus obtained will determine the wall outline of the cut above. In the same manner the mining and diamond drilling of the successive cuts above are done as stoping continues upward.

Tons per man-shift in all cut-and-fill stopes averaged 6.6 in 1943 up to June 1. Tons per machine-shift averaged more than nine times as much, or 61. The number of men in a stope depends upon its size but usually consists of a miner, a helper, a scraper man, and a fill trammer working on a two-shift basis. Each man in a stope receives miner's pay and is capable of doing any of the various jobs that arise.

Square-Set Stoping Is Limited

Only a limited amount of square-set mining has been done to date. Use of this method has been confined to sections of cut-and-fill areas where the stope back is too heavy to stand unsupported in cut-and-fill stoping. Where it is employed, the procedure is as follows:

Ground is broken in much the same manner as in cut-and-fill stoping. The breast is drilled high enough to accommodate the square-sets and is advanced for only one row of sets at a time. The cuts are started at the fill raise and are advanced in both directions to the stope pillars.

In drilling, the holes are spaced at intervals that are a little smaller than in cut-and-fill stoping. The intervals are 1 ft. vertically and 2 ft. horizontally. The round is 7 ft. deep. Blasting is governed by ground conditions.

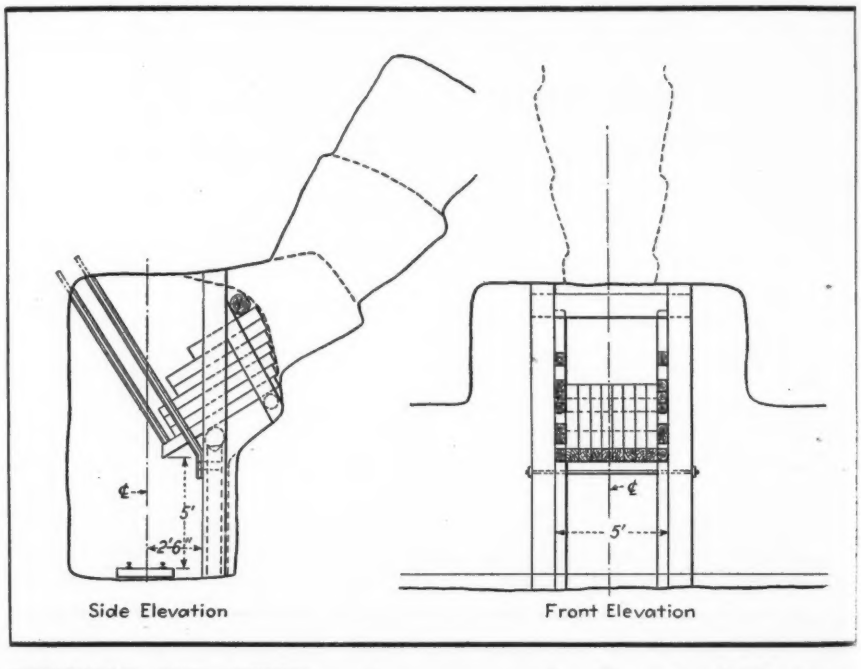
The ore broken in square-set mining is hand-mucked into the mill holes, which are "winged" to reduce the mucking distance. In some stopes where it is not convenient to raise mill holes beyond a certain floor, a gangway is maintained on this floor, chutes being built in it and mill holes raised above the chutes. "Maintaining" the gangway consists of lagging the outside of one row of sets and filling in around the row. Muck is trammed in this sublevel gangway to a convenient mill hole.

Standard square-sets, consisting of 10-in. local round spruce slabbed on four sides, are installed at 5 ft. 4 in. centers. Posts are 8 ft. long. The sets are blocked to the back to distribute the weight on the caps. Where the ground has broken too high above the preceding set, open cribs are put in temporarily. In a set, girt and post are "dogged" together with timber dogs of ¾-in. round iron having pointed ends 4 in. long, the two ends being about 12 in. apart.

Fill is spread in the square-set stopes with the 0.75-ton scoop car, which runs on an 18-gage track of 12-lb. rails which are laid on top of the sets below after the floor has been removed.

In these stopes, the same irregularities are encountered, due to the shape of the orebody, as are met in the untimbered cut-and-fill stopes already described, giving rise to the necessity of closely exploring the walls.

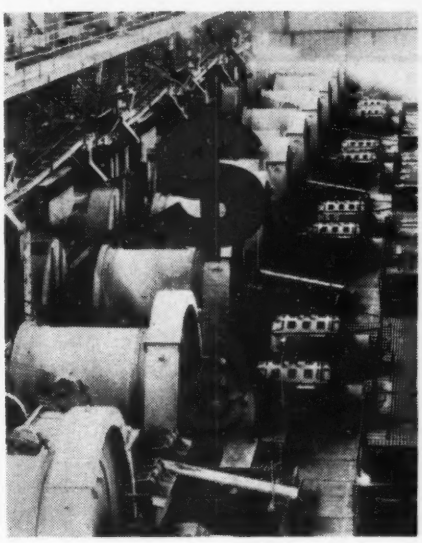
(*Continued on page 134*)



BOXHOLE AND CHUTE, such as are used with cut-and-fill stopes when the lateral shifting of the stope cuts overhead makes it necessary to go into the wall to draw off the ore

POSTWAR OUTLOOK for MINING

For the Operator of Mine, Mill or Smelter Accent Will Be on Cost Reduction . . .



• • • As a matter of fact, the accent in operation is ALWAYS on cost reduction, wherever management is on the job. Desire to make the maximum profit vies with the desire to leave as little workable ore as possible in the ground when mining is completed, this tending in each case to bear down hard on costs. In the postwar period this pressure will be increased, if only because the reserves of ores of better grade have shrunk so greatly due to war demand, leaving poorer materials to be worked. The effect will be felt in every department of a mining enterprise.

"ONE CROP OF MINERALS"—MAKE THE

War demand for metals has depleted ore reserves. To work the lower-grade material remaining means getting lower costs. Among other things where conditions permit, the operators can do the following:

Modernize the Drilling. The up-to-date air-driven rock drill is so far ahead of the drill of only a decade or two ago, that the operator who is using the older machines, many of which are still in service, has a chance to cut his drilling costs by modernizing.

Improve the Cutting Tool. Detachable bits are confidently expected to complete the conquest of bits forged on drill steel which was begun 13 years ago. Use of these bits offers important economies.

Consider the Core Drill. For drilling blast holes in large deposits where the ground stands well, or in ground that is extremely hard, the diamond drill also will be available.

Discard the "Muck Stick". Mechanical mucking, by scraper or loading machine, depending on the circumstances, will be essential to the postwar operator who has any respect at all for lower costs. Hand shoveling is definitely outmoded.

Postwar Mining Costs Must

So far as the problems with which it must deal are concerned, the mining industry is now on the threshold of the postwar period. Some of these problems are already with us; others will gradually present themselves. The broader questions were dealt with in preceding articles in the December issue. Attention is now focused on actual mining in an effort to visualize the changes which are likely to take place. It is here at the source of the raw materials, as well as in their subsequent treatment, that economies must be made to offset the prospective higher cost of labor and supplies and to facilitate profitable working of the lower-grade reserves spared by war demand. The faster rate of exploitation has impoverished many deposits and exhausted others.

In few cases has an orebody been entirely worked out. Rather, in the typical instance, the better portions have been taken, to get the most metal in the shortest time. This leaves our typical company with the problem of working the poorer, less favorably situated material. Improved technology or larger-scale operation, both of which serve to increase the output per man, provide the main avenue of escape from higher operating costs.

Technological improvement is a continuing process and is the natural objective of an engineering staff. In the mine it has meant the better use of the mining method employed, or of some modification of it, this being closely linked with the degree of mechanization achieved and the efficient design of the equipment employed. Better equipment in general should be reflected in better costs.

In contrast with the large group of war-metal producing mines are the gold properties, shut down in the United States but operating elsewhere, though long hampered by difficulty in getting men and supplies. These mines likewise will have their postwar problems—of re-equipping and rehabilitating the ones shut down and of making needed replacements and catching up on development work at others. Any increase in gold price, should such a fortunate event occur, will result in prompt revaluation, so as to include in reserves the poorest ore that would be workable at the new price. Thus these mines also will find cost reduction important.

Possibilities for improvement in mining practice can best be considered by scrutinizing the individual operations that enter into the task of mining ore and delivering it to a plant on surface or to shipping bins. Underground mining, divorced from consideration of choice of stoping method, is relatively simple, consisting of the unit operations, which are to be discussed. Stoping methods are eliminated from consideration, despite the effect of proper choice upon costs. Rarely is a method conducted without variation in details to accommodate it to conditions. It is attention to such details that makes a method work.

MOST OF IT!

Haul on Rubber. Rubber-tired shuttle cars and trucks offer possibilities for economy where clearances of mine openings permit. The future may see trains of shuttle cars.

Study the Pumping. Pumping is an essential operation. Many a mine would do well to revamp its pumping system, simplifying its complexities derived from haphazard growth. Incidentally it would save money.

Look at the Open Pits. Here (on the Mesabi) cost reduction is the order of the day and will continue so. The Range is a vast experimental laboratory for open-pit practice.

Come Down

The various operations are dealt with in the following. Emphasis is largely on equipment now available and possibilities for improvement rather than on practice involved. Progress in mining in recent years has been possible largely through betterment of equipment.

Drilling

The up-to-date air-driven rock drill, with its power feed, high drilling speed, low air consumption, long life and low upkeep cost, as well as its moderate weight, is so far ahead of the drill of a decade or two ago that anyone using the older machines, many of which are still in service, has a chance to cut his drilling costs by modernizing.

The pre-eminent position enjoyed by the air drill in the blast-hole field is not likely to be disturbed for years to come, despite the inefficiency of using compressed air to transmit power, and despite current use, in two dozen mines, of core drills for drilling blast holes. Further improvements are expected in construction and performance, as metallurgy makes possible the use of better alloys.

For headings requiring more than one drill the jumbo, once limited largely to tunnel work, is likely to be used.

Detachable bits are expected to complete the conquest of forged bits which was begun 13 years ago. This campaign will be speeded by further development of designs adapted to special rock conditions. Use of these bits offers important economies. By starting a hole at, say, $1\frac{7}{8}$ in. instead of around $2\frac{1}{4}$ in., and using a $\frac{1}{16}$-in. gage change as against a $\frac{1}{8}$-in. change with the other bits, the smaller hole can now be finished at required depth at a diameter permitting use of sufficient powder. The smaller hole can be drilled faster than a large one with the same machine, a minimum of unnecessary rock being cut. Power consumption varies about as the volume of rock removed. In line with the smaller bit there is a tendency to go to smaller alloy steel, 1 in. and $\frac{7}{8}$ in. quarter-octagon section.

In respect to bit cost, in the contest between the single-use or "throwaway" bit and the bit which is intended to give several re-uses with grinding or hot-milling, the significant figure is the cost per bit-use. The user, moreover, will not limit a bit to a single use, irrespective of its low cost, if it can be economically reconditioned.

For drilling blast holes in large deposits where the ground stands well, or in extremely hard ground or under certain other special conditions, the diamond drill, in models made lighter for one-man use, will also be available. Some 24 properties, almost all in Canada, are using this equipment thus. In massive orebodies such application cuts the cost per ton mined by reducing the amount of stope development work and permitting better blasting.

In all save one instance, these rotary diamond drills are operated by air. The one exception is notable: Here we have electrically driven, specially designed machines, which are engaged in drilling stope holes in the hardest kind of ground where they have gotten much bettter results than air drills were able to get. These are the first electrically operated blast-hole drills to work successfully. Whether they are the "ancestors" of a general-purpose electric rock drill of the future is a matter of conjecture.

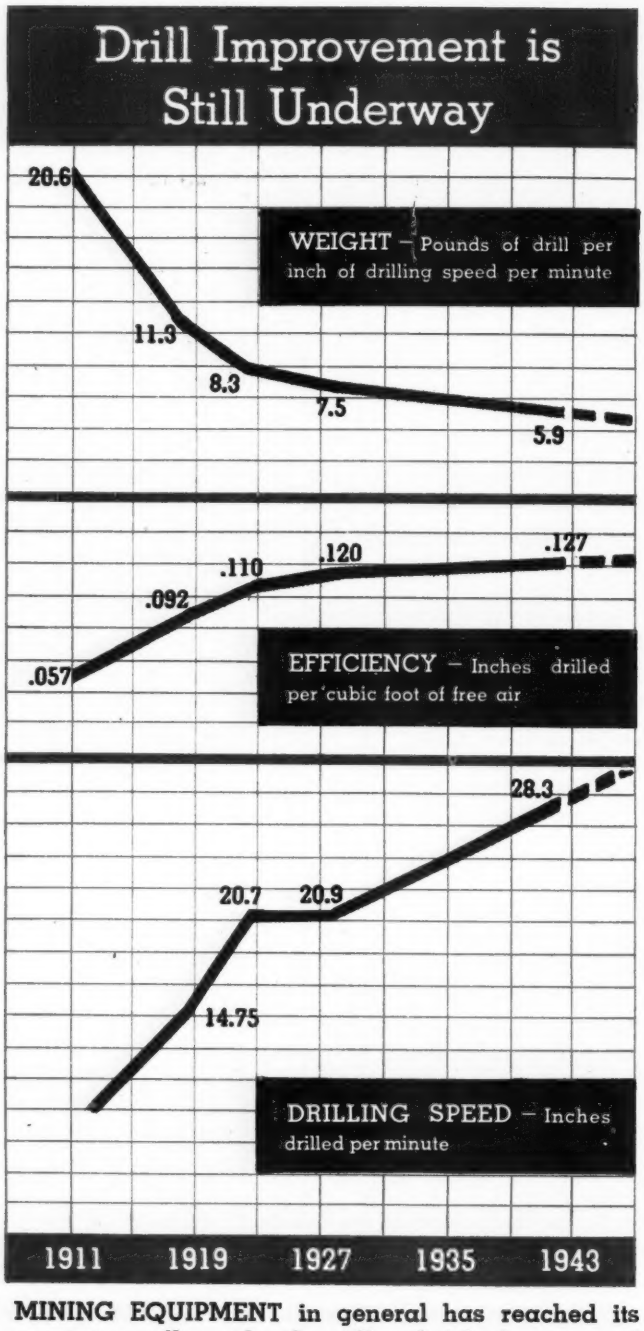
For exploratory work the diamond drill will be much in the postwar picture. Direction of holes will be better controlled and feeding will automatically keep the pressure constant. Greater interchangeability of parts will permit more efficient use. Bits and reaming shells mechanically set will further supplant the bit set on the job.

An adjunct of drilling is the compressor. The operator will have the engine-driven portable type in larger sizes—up to 500 c.f.m., this size being sufficient for two wagon drills. This will be built for better regulation and economy to save up to 30 percent in air cost.

Blasting, Mucking, Loading

Sharing with drilling the task of breaking ground, blasting practice, already highly efficient, offers a continuing chance for economy. The semi-gelatins, which replaced the gelatins some years ago, are a low-density substitute intended to promote economy in use.

Mechanical mucking, by scraper or loading machine, will be essential to the postwar operator who has any



MINING EQUIPMENT in general has reached its present excellence by the still unfinished process of step-by-step improvement so well demonstrated here

respect for lower costs. Hand shoveling is outmoded. Labor shortage has helped educate many a company as to the advantage of using a loading machine or of extending the use of scraping. Once tried, either practice is likely to be continued, especially where wages rise.

The up-to-date loading machine is rugged and well-designed. It makes the best return on the cost of purchase where it is most continuously employed. Several working places must be available and the loader, moreover, must not be made to wait for cars. These places are commonly development headings or in sill cuts on the level. Combination of loader and conveyor in a heading delivering to a surge bin for rail haulage has been suggested.

Scraping, long useful under varied conditions and with any kind of material, wet or dry, has ever new possibilities apparently. These have been created by development of remote control of the hoist, achieved by substituting air-and-electric or all-electric power for manual operation of the clutches on either the two- or three-drum units. The operator may stand at any distance. Remote control, in one case, has raised production 50 percent, largely because the scraper could be filled to capacity on each trip.

Also worth investigating is the full automatic electric control of scraping in transfer drifts. Rope costs may also be lowered by increased use of sheaves to support the rope properly and guide it on to the drum.

Transport and Haulage

For main haulage trolley and storage-battery locomotives will continue to share the field, much as at present. On other levels the smaller battery models can well find greater use, especially where they can be transferred readily in the shaft.

The postwar operator, having to select a car, and desiring greater efficiency and economy, will probably use the largest one that conditions will permit. Also following the trend, this car will probably be of the Granby type, of 50- to 200-cu.ft. capacity, for main haulage, and of the rocker-dump type, of 25- to 45-cu.ft. capacity, for use elsewhere. In building these cars there will be greater use of low alloy steel, particularly in the bodies.

Rubber-tired shuttle cars and trucks, as yet finding only limited use underground in *E.&M.J.*'s field, offer possibilities for economy where clearances of openings permit. Two types are in service: the four-wheel self-contained unit with conveyor for loading and unloading; and the tractor and bottom-drop trailer.

One user of the first type has increased efficiency by relatively shortening the haul, raising the speed from 3 to 4½ miles per hour, and operating more systematically with better trained men. Stronger construction and better design, with anticipation of breakdowns, have lengthened life and lowered maintenance costs. A combination battery-trolley car, holding 10 tons and making 5 miles per hour when loaded, is planned for long hauls from face to dump.

The future may see trains of shuttle cars and of tractor-trailer cars.

Belt conveyors seem to have possibilities for underground transport for the longer distances, more especially where a drift can be easily maintained. Instances of use as yet are too few to provide convincing data as to service under a wide variety of conditions. Two Mesabi mines have underground conveyors. However, the postwar operator seeking economies would do well to consider the comparative costs, under his conditions, of transport by conveyor and by some of the more familiar methods.

Shaker conveyors are available for handling coarse or fine but preferably dry material over intermediate distances. The few installations in this industry have had little publicity but appear successful. Substitution of a shaker line for a transfer scraper in conjunction with one mining method made it possible to complete a mining cycle per shift with fewer men.

Hoisting

Whatever be the long-time possibilities for improvements in hoisting, the postwar period will see further applications of the newer methods of controlling the hoist-motor current automatically, as in the amplidyne or equivalent system. In an outstanding installation, this control has resulted in rapid yet smooth, precise operation, reducing maintenance of the Ward Leonard set and hoist motor.

Design of skips, cages, and buckets will employ alloy steels and lighter metals. Shaft-signaling systems will see further needed improvement. Ore will more commonly be crushed before hoisting.

Shaft Sinking

Boring large-diameter holes with the shot drill or with apparatus derived from it, to serve for ventilation or other purposes or to be enlarged to shaft size, will be an ordinary matter in the postwar period, with a saving of money. Holes 48 in. in diameter are no longer unusual, 6-ft. diameter holes have been bored, and plans for one hole 10 ft. in diameter are under way. Two large copper companies have their own equipment. The apparatus used in a 5-ft. hole in California and in 5- ft. and 5½-ft. holes in the Iron Country is also well known. As technique is perfected, the per-foot cost should come down. Along the same line, efforts have been made to sink a 48-in. hole by drilling a 12-in. hole with cable tools followed by successive reaming operations.

Shaft mucking, normally arduous, has recently been done successfully with a clamshell bucket operated from an overhead traveling hoist supported on a movable frame. This fills the bucket in the shaft bottom.

Other Operations

Pumping is an essential operation and merits study. Many a mine would do well to revamp its pumping system, simplifying the complexities derived from haphazard growth and improving its over-all efficiency. Incidentally it would save money. The trend is away from plunger types to the multi-stage centrifugal and the vertical turbine impeller type.

Any improvement of working conditions, such as by mechanical ventilation or air-conditioning, is good business, even though it be hard to appraise in dollars and cents. Mechanical ventilation will be provided save where a strong, natural air current makes it superfluous. Most mines that reach below shallow depths have one or more "main" fans, usually reversible, of varying capacity. Auxiliary to these or installed without them are the small blowers commonly used with ventilation tubing to renew the air in headings or to remove smoke and dust.

Air conditioning, or cooling, is available where needed. Portable units will usually suffice to condition warm places, supplying the cool air through tubing.

Lighting will be improved, even though electric cap lamps are used. Stopes are most in need of it and even many haulageways and stations are poorly lighted. Judicious use of floodlights will be worth while.

Open-Pit Practice

Turning attention to open-cut operations; we find on the Mesabi a region where open-pit mining technique has undergone tremendous changes in the past seven years, all with the objective of permitting recovery of ore at minimum cost as pits deepened, with the proportion of tonnage tied up in track benches increasing. Today this area presents the spectacle of a medley of methods and varied equipment comprising shovels and draglines of all types of drives and mountings; standard-gage railroad haulage, with steam, electric, and diesel-electric locomotives; trucks and conveyors in varying combinations; tractors and miscellaneous other equipment. Here cost reduction is the order of the day and will continue to be so in the postwar period. The Range is a vast experimental laboratory for open-pit practice as well as the world's greatest present source of iron ore.

Some trends are as follows:

The capacity of the Mesabi dipper, which was 4 cu.yd. up to two years ago and then moved up to 5 cu.yd., is now 6½ cu.yd. to an important degree. Dipper size tends to increase as truck capacity goes up.

As to transport, railroad-type haulage, where already installed and the tonnage to be mined is very large and the matter of tying up a certain tonnage in track benches is not important, gives the lowest cost per ton. These conditions do not obtain except in the largest pits, however, and so the use of trucks and conveyors continues widening, the trend being toward application of both in combinations that depend upon circumstances. On short hauls and moderate grades, trucks will be used. On longer hauls or higher lifts, where economic considerations justify the transfer of material, conveyors will be added. Already 18 mines have inclined conveyors from pit to surface. Trucks are likely to continue in use for short shuttle service and for gathering ore from shovels and delivering to a central point, which may be either the final loading point or the conveyor feed-point within the pit. Due to present scarcity of labor, 30- to 40-ton trucks have recently had preference over the 15- to 20-ton units.

One important company puts the average cost of transporting a ton of ore out of its pits by conveyor at 16 mills. It would cost 53 mills per ton, on estimate, to truck it out. Another operator finds that his truck-haulage cost per ton for operation within the pit averages 70 mills for 1,000,000 tons per year.

Existence in operation of a belt conveyor 1,000 ft. long between end pulleys, or about three times the length used thus far in open-pit work, should be watched. This belt is reinforced with longitudinal steel wires.

Churn-drilling practice in open-pit work has gone from 6-in. to 9-in. holes, where the rock is hard, a step-by-step development, involving the development also of a new machine for dressing the larger bits. "Tons of rock per pound of explosive" remains the same. The larger drill pays for itself quickly.

Reducing Postwar Milling Costs

WHY IT MUST BE DONE
HOW IT MAY BE DONE

A Staff Survey*

ONCE THE WAR IS OVER and the special wartime problems now vexing this country's miners have been settled for good or ill, the continuance in the United States of a healthy independent mining industry will depend largely on the ability of that industry's members to jam production costs down to a minimum and keep them there.

The plain fact is that domestic miners have run, or are rapidly running, through the best of this country's orebodies, and before long there will be only the poorest grades left; those, in short, whose exploitation involves complicated and expensive milling processes. Thereafter, to compete with foreign higher-grade sources, and to continue to pay high wages at home, this country's miners have the choice of: (1) setting up a powerful lobby in Washington to cry for help in the form of subsidies; (2) going somewhere else to mine; (3) finding cheaper methods of mining and going on as independent miners right where they are now. If the mining industry is to make a go of the third choice, much of the burden of improvement will be thrown on milling and smelting operations.

1. Labor Costs in the postwar period must be reduced along with all other milling costs. This is particularly true of the smaller operations like the 400-ton concentrator whose milling costs are shown in Table II.

There are only two ways to cut labor costs. One, the old way, is to dock everybody on the payroll 15 percent. The better way is, obviously, to increase the tonnage handled per man-shift either by giving the men better, more productive equipment with which to work or by replacing men with automatic equipment.

The question of what to do with men so replaced by machines has no part in this discussion. We are concerned here with the survival of a basic industry, an industry which can survive only by operating more cheaply. It can operate more cheaply by replacing as many men as possible with automatic machines. To the technician or to the accountant there is only one answer, "Use the machines." The greatest misfortune in the world today is that sociology has no equally ready solution for the problem of the excess manpower put out of work by these machines.

Several automatic control devices are already in use, although the possibilities of such equipment have hardly begun to be explored. For example, the Massco den-

*Grateful acknowledgment is made of the advice and opinions of A. M. Gaudin, A. F. Taggart, P. Malozemoff, S. J. Swainson, and other metallurgical engineers.

WHERE BIGGEST SAVINGS C

1. Labor

"Increase the tonnage handled per man-shift, either by giving the men better, more productive equipment with which to work, or by replacing men with automatic equipment."

2. Crushing

"Crushing costs in the immediate future will be lowered only by paying more attention to automatic accurately-controlled feeding arrangements, by use of better alloy steels, and by improved crusher design."

3. Grinding

"The average ball mill is about 0.4 to 0.8 percent efficient. That is, the energy output in the form of new surface produced, divided by the energy input and multiplied by 100 equals a figure the industry ought to be ashamed of. Even a steam engine is a marvel of efficiency by comparison."

CAN BE MADE

4. Flotation

"It is not beyond the abilities of present-day metallurgists to design a mechanical cell so large that 30 roughers and 10 cleaners like it could handle 25,000 tons daily of Morenci's copper ore."

5. General Equipment

"Manufacturers have all been occupied in varying degrees with war work, but they have had time to plan. The new equipment for sale after the war will show the results of that planning."

6. New Methods

"The time-honored methods of ore dressing will not in themselves be adequate to handle the low grade impure ores of the future . . . The mining industry will adapt to its own purposes such methods of the chemical industries as may be applicable and useful."

sity controller and the Hardinge electric ear are used in fine-grinding circuits, and automatic gas and liquid analyzers are used in smelter and acid plants. A possible application of automatic control that suggests itself is a pH measuring and recording device which would control the lime feeder in a flotation circuit. Automatic weighing ore feeders have grown common of late.

An excellent example of instrument control is furnished by the new slag-treatment plant of Bunker Hill & Sullivan Mining & Concentrating Co. at Kellogg, Idaho, where zinc is now recovered from 300 to 400 tons of lead blast furnace slag daily. Standing at one 8½ by 15-ft. control board, a plant operator can watch over all important factors of fuming furnace, boilers, baghouses, and deleading kilns. By means of valves and switches on the panel, the operator can control the plant manually, or he can set the conditions he desires, and operation will be automatic thereafter.

2. Crushing Rock, one of the larger items of cost at most mills, has seen no striking improvement in technique since 1858, when the Blake-type jaw crusher was invented. As was pointed out by Gaudin, the industry is still squeezing rocks to pieces with massive nutcrackers, distinguished from their dinner-table counterparts only by their size.

Better crushers are, of course, being designed right along. The emergence of the gyratory crusher is an example, and, more recently, improved jaw crushers have been offered; but what is wanted is some new application of force that will crush large rock fragments without requiring the brute strength of present methods.

Pending development of some new method, crushing costs in the immediate future will be lowered only by paying more attention to automatic accurately controlled feeding arrangements, by use of better alloy steels, and by improved crusher design.

3. Fine Grinding, without a doubt, is the milling operation in which there is the most room for improvement from the viewpoint of cost reduction. This is indicated by the universal experience of mill men and, specifically, by the cost figures given in Tables I and II. Yet, not all mill men realize just how inefficient and expensive their fine-grinding equipment is. If they did realize it, they might demand something better, and they might get it.

Without going into the underlying theory, it can be stated flatly that the average ball mill is about 0.4 to 0.8 percent efficient. That is, the energy output, in the form of new surface produced, divided by the energy input and multiplied by 100, equals a figure for efficiency that the industry ought to be ashamed of. Even a steam engine is a marvel of efficiency by comparison.

The 400-ton copper mill whose milling costs are given in Table II was paying out $0.29 per ton to grind ore to flotation size. Of this, only about $0.002 actually bought any ground ore; the rest, amounting to $0.288, went for abraded balls and liners, for grease in the bearings, and for about a 10-deg. rise in the temperature of the mill pulp. That's hardly a bargain.

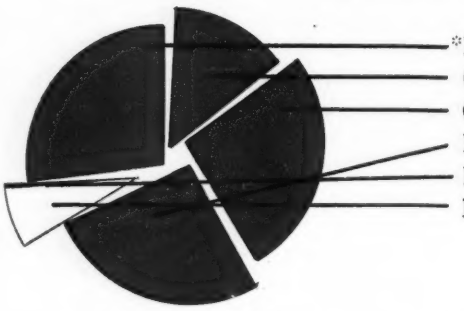
One of the most efficient grinding plants on record is one in Canada which is housed in a mill building so well insulated that the heat from the ball mills is enough to keep the place warm all winter. This company gets at least a little of its money back; most companies continue to throw 99.5 percent of their grinding dollars away.

All this is not, unfortunately, a prelude to the disclosure of a startling new method of grinding. It is merely a reminder that grinding costs must be watched. It is also a suggestion that the industry demand of manufacturers and of research men that they work out an efficient yet inexpensive grinding method, and the sooner the better.

Reducing the quantity of pulp to be ground is an indirect method of cutting grinding costs, and it is by doing this sucessfully that the heavy-density processes have gained much attention of late. There are two variants of the heavy-density process now commercially available: the Heavy-Media process, sponsored by American Cyanamid Co.; and the Sink-Float process, offered by Sink-Float Corp. The aim of both is to separate valuable mineral from gangue at a coarse size by passing

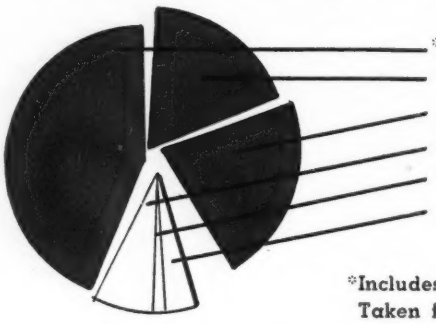
MAJOR COSTS MUST BE CUT FIRST

TABLE I. Milling Costs in a 50,000-ton Copper Concentrator



	$/ton milled	Percent of total
*Labor	0.0823	27.2
Crushing	0.0369	12.2
Grinding	0.0793	26.2
Flotation	0.0778	25.8
Dewatering	0.0022	0.7
Miscellaneous	0.0237	7.9
	0.3022	100.0

TABLE II. Milling Costs in a 400-ton Copper Concentrator



	$/ton milled	Percent of total
*Labor	0.584	46.5
Crushing	0.234	18.6
Grinding	0.291	23.2
Flotation	0.098	7.8
Dewatering	0.012	0.9
Miscellaneous	0.038	3.0
	1.257	100.0

*Includes all labor costs. Other items include only expense for supplies and power.
Taken from U.S. Bureau of Mines Information Circulars. No. 6479 and No. 6489.

the ore through a heavy medium in which rich fragments will sink but on which barren fragments will float off to be discarded.

Heavy-Media separation at the Central Mill of Eagle-Picher Mining & Smelting Co. at Cardin, Okla., was responsible for increasing the mill's capacity from 5,500 tons of zinc-lead ore daily to 12,500 tons. In *E.&M.J.* for November 1943, page 99, Elmer Isern, superintendent of concentrators for Eagle-Picher, reported that the use of the Heavy-Media process had resulted in an increase of 129 percent in ore milled, a decrease of 8 percent in power consumed per ton milled, an increase of 33 percent in tons milled per man-shift, and a decrease of 45 percent in ZnS content of the mill tailings.

At the West mill of Bunker Hill & Sullivan Mining & Concentrating Co., Kellogg, Idaho, also treating lead-zinc ore, installation of a Sink-Float plant and modernization of grinding, pumping, and flotation equipment resulted in increasing the mill's capacity from 1,000 to 1,500 tons daily, improving metallurgical results and substantially reducing milling costs.

Use of the Heavy-Media process has spread to several other lead-zinc mills, to the Iron Range, and to fluorspar and magnesite plants, and reports thus far have been approving. No mining company to whose ores these processes are at all applicable can afford to overlook the possibility of effecting savings such as the two companies mentioned have made.

4. Flotation is the field in which the mining industry can expect the biggest advances in the years to come. Enough work has already been done in developing new reagents and in controlling old ones to permit the statement that flotation will soon be applied to ores now thought too low grade or too impure to treat successfully.

This will be particularly true of non-sulphide ores, long the most difficult to concentrate by flotation. It is likely that before long methods will be developed that will be as startlingly successful in floating non-sulphide minerals as methods using xanthates and similar collectors were in treating sulphides.

It seems certain that as better and cheaper reagents are developed, less and less will have to be spent on supplies for flotation units. This will be of particular importance to large-scale operations like the one whose costs are shown in Table I.

As for power cost in flotation, action does not seem so imminent, although it certainly should be. The fact is that development of flotation machines has lagged far behind development of flotation reagents, and it is high time that it caught up. Our present machines are too small, too awkward, too wasteful of power, and too inefficient generally to stand up to the demands the postwar mining industry will make of them.

One demand of the future will certainly be for flotation cells of larger individual capacity. Consider the new Morenci concentrator of Phelps Dodge Corp. Here, before a recent expansion in capacity, there were operating 332 Fagergren cells, 240 of them (the roughers) 66 in. square and 92 of them (the cleaners) 56 in. square. Each cell has its own motor, a vertical-type gear

motor, with the impeller mounted directly on the extended slow-speed shaft. There are 332 motors, shafts, bearings, impellers, and gears, to look after, lubricate, and replace, to say nothing of all the incidental wiring, switches, and launder connections.

These cells were selected for the Morenci job on the basis of lengthy competitive tests on Morenci ore of all the leading types of flotation machines, and the Fagergren machine proved to the satisfaction of the management that it was the best then available for treating Morenci ore. Therefore it is no detraction of this machine to say that before many years the use of 332 flotation cells to treat 25,000 tons of copper ore daily will seem somewhat ridiculous. It is as though instead of using four 300-ft. thickeners for tailings disposal, Morenci had installed 200 thickeners, each one 14 ft. in diameter.

It is not beyond the abilities of present-day metallurgists to design a mechanical cell so large that 30 roughers and 10 cleaners like it could handle 25,000 tons daily of Morenci's ore. When machines like that are built, one may expect a considerable drop in the "Power" item under flotation costs.

If this seems visionary to you, remember that if Phelps Dodge had had to use at Morenci flotation machines of the original M.S. type, at least 1,000 cells would have been required to provide a capacity equal to the 332 Fagergren cells. The change to fewer, larger units is not impossible—it is inevitable.

5. General Equipment. Just what, or how much, will be available in the way of new and improved equipment after the war is a secret which manufacturers are guarding quite closely. They have all been occupied in varying degrees with war work, but they have had time to plan, and the new equipment for sale after the war will show the results of that planning.

Naturally, manufacturers do not care just yet to announce the form of some machine they are not now able to make, but it does no harm to speculate. For example, what use will there be for light metals? Will there be increased use of all-welded construction? Is there a use for electronic devices in milling practice? What new alloy steels are available? Will production shortcuts, developed as war necessities, help produce lower-cost mining machinery? The answers to questions like these are now on a dozen drawing boards.

In this field of speculation about the future, one has a number of interesting possibilities to contemplate. For example, it is not impossible that mills may some day have automatic assaying equipment that will give continuous records of the metal content of concentrates and tailings, perhaps lagging behind actual pulp conditions only by minutes. As shown in Tables I and II, a large part of those items, "Miscellaneous," is made up of sampling and assaying expense. This development would cut those down.

6. Methods. One statement about postwar milling that can unhesitatingly be made is that the time-honored methods of ore dressing will not in themselves be adequate to handle the low-grade impure ores of the future. Entirely new methods may be developed, but the stronger possibility is that the mining industry will adapt to its own purposes such methods of the chemical industries as may be applicable and useful.

As an example of how this change will come about, there is the process used at the plant of Manganese Ore Co. near Las Vegas, Nev., where an ore containing about 12 percent Mn is being concentrated to a 60 percent Mn sinter. Early in the laboratory work on this ore it was found that ordinary methods of gravity concentration, flotation, or leaching were unsatisfactory for the ore available, and only by a combination of ore dressing and chemical engineering was this solved.

The big Goiaz nickel deposits in Brazil could not be worked by smelting, flotation, tabling, or any other form of concentration; but they did yield to a chemical process now being tested on pilot-plant scale by American Smelting & Refining Co. There will be many more such examples in the future, and no college graduate in ore dressing from now on should consider himself educated unless he has a good acquaintance with the unit processes and the theories of chemical engineering along with his thorough knowledge of the techniques of his own branch of engineering.

Even today ore testing is not the relatively simple job it was a few years ago. Each new ore is likely to be a research problem in itself, and each will demand its own special application of the basic tools of chemical and metallurgical engineering.

Research in ore dressing, both fundamental and applied, must therefore be intensified if the United States is to continue as a great mineral producing nation. By "intensified" is meant not just doubled or tripled but increased by perhaps 1,000 percent over what was once normal peacetime activity. The industry should begin now to determine how it is going to treat the ores it will have to mine eventually.

In closing this discussion of milling costs, mention must be made of an aspect of the matter which should be obvious yet somehow doesn't always seem to be. That is the necessity of keeping everything in the mill running in best possible condition and at the peak of efficiency.

Leaking launders, frequent spillage, squeaking bearings, haywire makeshifts of all kinds; these things cost money and shouldn't be tolerated. As he looks at each piece of equipment in his mill, the superintendent should ask himself, "Is this doing the job as effectively and efficiently as it could be done? Is there any way by which we could do this job cheaper or easier?" This habit of thought can make a tremendous difference to the cost sheet of a mill where it has not been applied previously.

What this whole discussion boils down to is that the carefree days of mining in this country are over. The only way domestic mill men can independently meet foreign competition is to make use of every labor-saving, high-capacity device and process that manufacturers and researchers can produce, and to keep these tools working at top-notch efficiency.

The time to begin thinking out your own solution to this problem is now.

Possible Economies for Postwar Ore Reduction

CARLE R. HAYWARD

Professor of Process Metallurgy, Massachusetts Institute of Technology, Cambridge, Mass.

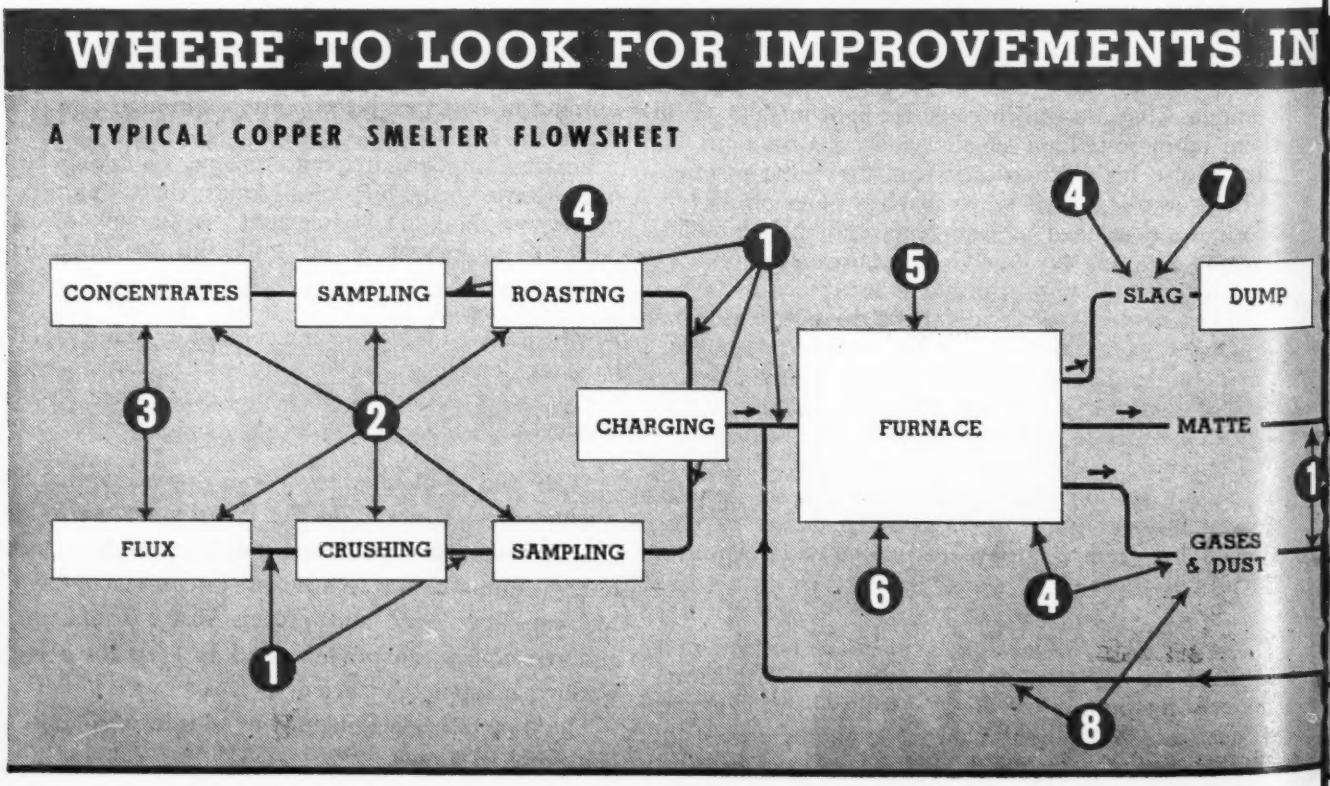
No one familiar with the mineral industry as a whole can accuse it of being non-progressive. The public owes a great debt to those who have made it possible to mine, concentrate, smelt, and refine low-grade and refractory ores so as to produce metals and other mineral products cheaply and in quantity for innumerable purposes.

I am fortunate in having a wide acquaintance among operating men, particularly in the field of non-ferrous metallurgy. They are an able group and are continually watching for ways to improve operations and cut costs. It is always of interest to note changes which have taken place in plants during intervals between visits. Therefore it is in no spirit of criticism that a few remarks are here recorded on possibilities for further improvement.

A spectre which always confronts the metal producer is the diminishing supply of high-grade ores and the consequent necessity for working up lower-grade materials. Thus far the burden of handling this problem has been borne largely by mine and concentrator. Progress in mineral dressing has been such that the smelter has been supplied with even richer concentrates than he formerly treated, but as time goes on it seems probable that the cost of producing such concentrates will gradually increase and will result in higher costs of the metal unless savings can be made in smelting and refining. I will try to point out in a general way where we must look for economies.

One way to accomplish the desired result is to retain the present types of equipment but perfect them and improve methods of operation. A second way is to make changes in procedure which will involve new types of equipment or entirely different methods of operation.

Methods and equipment for smelting and refining the common metals have not changed radically for many years, and gradual improvements over this period have brought both equipment and operation to such perfection that it is hard to suggest anything that could produce major economies. Several things will be men-



tioned, however, which are so common in operating practice that they may sometimes be easily overlooked. These are

No Radical Changes Needed

1. Such obvious things as handling materials and, 2, making each piece of equipment perform at maximum efficiency.

Some defects exist in these operations in most plants. They are known to the management and are condoned for reasons which seem good. It is likely that a multitude of small savings would produce surprising sums.

3. More careful preparation of raw materials.

Pressure should continually be put on the concentrator to furnish the most satisfactory material for smelting. One needs only to compare the smelting of copper and lead concentrates today with the practice before the advent of differential flotation. The notable recent improvements in sintering practice for both lead and zinc concentrates are, it is hoped, but the beginning of further advances in preparing material for subsequent metal extraction. Most furnaces work best on a certain type of feed, and it is often good economy to prepare such feed for it rather than force it to smelt a less suitable charge. Better preparation of the lead blast-furnace charge might simplify the present trouble with drosses.

4. Fuel economies.

The present era of relatively cheap fuels may be transient and it is not too early to give real thought to getting the most from our calories. Even such common things as better combustion or controlling the combustion in desired spots, furnace insulation, and recovery of heat from waste gases are worth careful attention. In addition, such items as recovering heat from slags and other molten products might be reconsidered.

Most important is effective utilization of the fuel value of concentrates. Surely there must be ways in which the not inconsiderable amounts of heat here represented can be used to replace equivalent heat values in common fuels.

5. Furnace design and operation.

Over a period of years the reverberatory furnace for smelting copper concentrates has varied from 80 ft. in length up to 160 ft. and back to between 80 and 120 ft.; for structural reasons the width has varied from 20 to 30 ft. Various schemes have been tried for building and maintaining side walls and roofs. Depth of charge and methods of feeding vary. There must be some best construction and best method of operation. Careful comparison of results would be desirable to determine where the greatest economies lie.

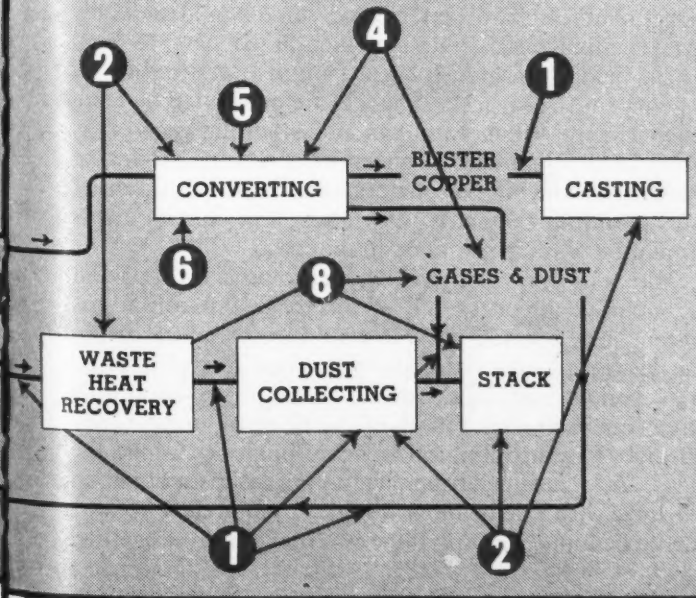
The same generalizations can be made about the lead blast furnace. Is the wide furnace with small tuyeres a step in advance? Should we make a radical change in design, such as J. S. Stewart suggests?[1]

Traditional secrecy in the zinc industry has undoubtedly retarded general progress here, although individual companies have developed independently some new procedures. The standard Belgian-type retort now has competition in the continuous vertical retort and the continuous electro-thermic furnace. Both of the latter save fuel value of the CO gas from the condenser and minimize the loss of zinc vapor.

Competition has stimulated economies in the older

[1]*Engineering and Mining Journal*, July, 1943, p. 64.

IN PLANT AND PRACTICE



POSSIBLE IMPROVEMENTS WITHOUT RADICAL CHANGE

1. Better materials-handling
2. Maximum efficiency for all equipment
3. More careful preparation of raw materials
4. Fuel economies — Better combustion — Better insulation—Recover waste heat from gases, slag, and other productions—Utilize fuel value of concentrates
5. Improvement in design
6. Adoption of better refractories
7. Avoid slag losses
8. Better handling of flue gases — Recovery of dust and sulphur — Make the expensive, tall stack unnecessary

practice, and the industry will undoubtedly benefit when practices which are now secret become better known.

6. Improved refractories.

Few parts of a furnace have received so much attention as refractories. It is probable that the thought being given to types of refractory material which are best fitted for roof, wall, and hearth design, and for making repairs in least time, will produce important economies.

7. Clean slags.

It is imperative that methods be developed to prevent the continuing waste of metals in dirty slags. The process for fuming lead slags is an important step in the right direction, but copper smelters have been too complacent in accepting present slag losses. Many papers have been written on the causes of these losses, but no practical way has been developed to avoid them. It is time a remedy was forthcoming.

Tin slags are notoriously high in wasted metal. More careful choice of procedure might minimize this loss.

8. Handling of flue gases.

The layman is always astonished to learn that flue gases by weight constitute the largest product of a smelter. The enormous stacks and flues bear testimony to the volumes handled.

Even minor improvements in the handling of these gases and the entrained dust and fume sometimes result in important economies. One intriguing thought is the ultimate result of several processes developed for removal of sulphur from these gases. It may be that, if they are perfected and generally adopted, the necessity for high and expensive stacks will disappear. In any case, with such a large product carrying in it numerous byproducts, the opportunities for saving in plant investment, maintenance, and operation are always present.

Big Savings Mean New Methods

Probably, any radical reduction in costs of producing metals will come only from radical changes in procedure. A few possibilities will be mentioned. Some have been suggested on other occasions, but none has had large-scale application. There are other possibilities.

1. Use of oxygen or oxygenated air for smelting and refining.

Most metallurgists see many advantages in using oxygen in some form, but the subject is usually dismissed on the ground that oxygen is too expensive. Many believe, however, that intensive research would develop a cheap method for enriching air to 25 or 30 percent oxygen at the place of use, and some believe it possible to produce relatively pure cheap oxygen. The subject merits more consideration.

2. Use of low pressures or vacuum.

Vacuum casting is common on a small scale and vacuum melting is not unknown. Its large-scale use may not produce direct economies, but doubtless production of sounder castings would result in indirect economies. Furthermore, certain chemical reactions can be accelerated or retarded in reduced atmospheres. New techniques would be required for producing vacuum or low pressures in large containers, but the results might reward the effort. Specifically, such procedure might find application in the reduction of zinc oxide or the treatment of ores containing volatile oxides.

3. Use of pressure or high atmospheres.

The effect of atmosphere is so important in furnaces for smelting and refining that it is astonishing more attention has not been given to methods for controlling them. Atmospheres in heat-treatment furnaces are regularly controlled. Slight excess pressures by constituents of the furnace atmosphere might produce astonishing results in hastening or retarding certain reactions.

4. New methods for decomposing pure minerals.

The day may not be far distant when flotation technique will make it economical to produce pure minerals in quantity. We should be ready for this by studying possibilities for decomposing the minerals by less drastic methods than present smelting procedure. For instance, a concentrated effort to decompose galena or sphalerite by application of physical-chemical or electro-chemical laws might prove simple and cheap. If such procedures were now available they would be a stimulus to those who are perfecting methods for better concentration.

5. Radical changes in smelting procedure.

Two examples which have been tried but not generally adopted may be mentioned. It can be shown that it should be possible to smelt copper concentrates in a converter-type vessel without use of fuel. It would be easy if preheated or oxygenated air were available. Full-scale tests with properly modified equipment have not been made or at least made public. Driving heat downward through thick layers of slag in a reverberatory is inefficient. Expenditure of considerable money would be justified to develop a radically new procedure utilizing the fuel value of the concentrates.

The second example is: more extensive use of the ore hearth for lead[2] smelting. Full advantage has not been taken of the economies inherent in this process.

Most of the radical changes suggested would require years of research to perfect, and some would probably prove impractical. They are mentioned here to keep them before the industry and stimulate pioneering.

Some of the suggested changes are predicated on commercial application of fundamental scientific knowledge, such as development of cheap methods for producing oxygen, producing and maintaining vacuum, and other technical improvements. Obviously, such developments would be of immense value to industry.

The long period of time which often elapses between a scientific discovery and its practical application has often been pointed out. It would be of advantage to civilization if concerted attempts were made to lessen this period, and there would be no more opportune time for beginning this than in the years immediately ahead. The metallurgical industry might well take the lead. A large sum of money and an enthusiastic group of men with open minds would be required, but ways could be found to bring these two prerequisites together.

[2] "Mineral Industry," 50, 343.

Iron Concentration Tests Lick Hard-Water Problem

W. E. KECK, *Associate Professor, and* PAAVO MAIJALA, *Research Engineer*
Michigan College of Mining and Technology, Houghton, Mich.

THAT HEMATITE and magnetite can be selectively floated from silicious minerals with fatty acids and soaps thereof is well known. With these reagents, it is also well known that a slight alkaline condition (as from sodium hydroxide) is beneficial, that hard feed water may interfere, and that coarse hematite cannot be selectively floated from fine silicious minerals. In the laboratory of Michigan College of Mining and Technology approximately 70 percent of the iron in an iron-ore washer tailing was recovered in a concentrate containing 60 percent iron and 10 percent silica by flotation with fatty acids and caustic soda in distilled water—much of the iron loss in the tailing being due to coarse hematite particles that could not be floated without also floating fine silicious particles. However, when a hard water was substituted for the distilled water, no separation whatever was made.

To eliminate these difficulties, the present process was developed. It consisted of (a) flotation of fine hematite and depression of silicious minerals with crude tall oil soap (from crude tall oil and commercial flake caustic soda), fuel oil, and sulphuric acid to reduce the pH of the pulp to about 7.3; (b) flotation of silicious minerals and depression of coarse hematite in the tailing pulp resulting from operation (a) with lime sufficient to increase the pH to about 11.0; and (c) treatment of the tailing pulp resulting from operation (b) in some gravity concentration apparatus to separate the coarse hematite from the coarse silicious minerals.

The process operated with water of any degree of hardness due to calcium bicarbonate and similar compounds, since under the conditions of (a) calcium and similar compounds did not interfere with the first flotation step and since a calcium compound concentration as great or greater than a hard water was absolutely necessary for the functioning of the second and for the best functioning of the third step. In the third step the separation due to the difference in specific gravities of the hematite and silicious minerals was intensified by a non-wettable film and air bubbles on the lighter silicious minerals, whereas the hematite particles were wettable and without bubbles. It should be noted that this condition is diametrically opposite to that of gravity concentration of tailing from the flotation of hematite. In this last procedure the water-repellent film and adhering bubbles on the hematite tend to nullify instead of intensify the separation due to differences in specific gravity.

★ Ore beneficiation research also finds way to float silica selectively without use of costly reagents in recovering hematite from a commercial washing plant tailing in Minnesota ★

As an example, a tailing from commercial iron ore washing in Minnesota was floated in a laboratory mechanical machine according to the above process in a four-batch locked test with cleaning of the flotation concentrate and hand-panning of the silica flotation tailing. Panning—a poor substitute for other methods of concentration, especially when film and similar flotation phenomena are involved—was used because not enough material was available for a table or like test. The lime content of the water for flotation and panning was 44.5 ppm. Reagent quantities for the fourth batch of the locked test were: crude tall oil, 2.00 lb. per ton; sulphuric acid, 0.85; caustic soda, 0.32; fuel oil, 0.50 and hydrated lime, 1.00—all quantities being based on a short ton of the dried original feed. For flotation, the conditioning time was 3 minutes and the flotation time was 7 minutes—5½ minutes being spent in hematite flotation and 1½ minute in silica flotation.

With these conditions, pertinent data from the fourth batch were: hematic concentrate—58.4 percent iron, 12.14 percent silica, recovery 79.1 percent; panning concentrate—56.2 percent iron, 16.92 percent silica, recovery 75.2 percent; and hematite plus panning concentrate—57.3 percent iron, 14.50 percent silica, recovery 78.1 percent. Recoveries were based on finished concentrates and tailing—this procedure assuming that the middling products could be retreated and beneficiated as effectively as the finished products. The silica concentrate contained 5.4 percent iron and constituted about 45 percent of the feed. The silica flotation tailing, the feed to panning, was about 27 percent of the original feed. Grades and recoveries of the cleaner concentrates from the fourth batch of two similar locked flotation tests were respectively 59.6 and 61.0 percent iron, 10.68 and 8.36 percent silica, and 70.1 and 69.2 percent recovery.

The same separation tendencies prevailed when the following substitutions were made in the tests: (a) distilled water or water with a lime content of 13.5 ppm. instead of water with a lime content of 44.5 ppm.; (b) oleic acid or fish oil instead of crude tall oil; (c) sodium hydroxide instead of lime; (d) another iron ore tailing instead of the one described. When tabling was substituted for panning in (d), separation improved.

The slimes from the experimental crushing, jigging and tabling of a Michigan iron ore were also treated with the foregoing process in a single batch laboratory test. Reagent quantities were: crude tall oil, 0.50 lb. per ton; caustic soda, 0.08; fuel oil, 0.50; sulphuric acid, 0.70; and lime, 1.0. Because of the fineness of the feed, nearly all of the hematite and much of the silica were floated into their respective concentrates, and therefore the feed to panning was 17.7 percent of the original feed and contained only 7.6 percent iron. Nevertheless panning

produced a concentrate that contained 35.8 percent iron. Recoveries by flotation cleaner and middling products were respectively 46.5 and 42.4 percent —the cleaner concentrate containing 57.4 percent iron and 14.9 percent silica.

Although they were preliminary, these tests show that the adverse effects of hard water were counteracted, that silica was selectively floated without costly reagents, and that these processes are worthy of consideration in the treatment of the above and other ores.

We gratefully acknowledge the aid received in this work from G. C. Dillman, president, and N. H. Manderfield, professor of mineral dressing, Michigan College of Mining and Technology[1].

[1] Patent rights to the described processes are reserved by W. E. Keck, assignor to the Michigan College of Mining and Technology.

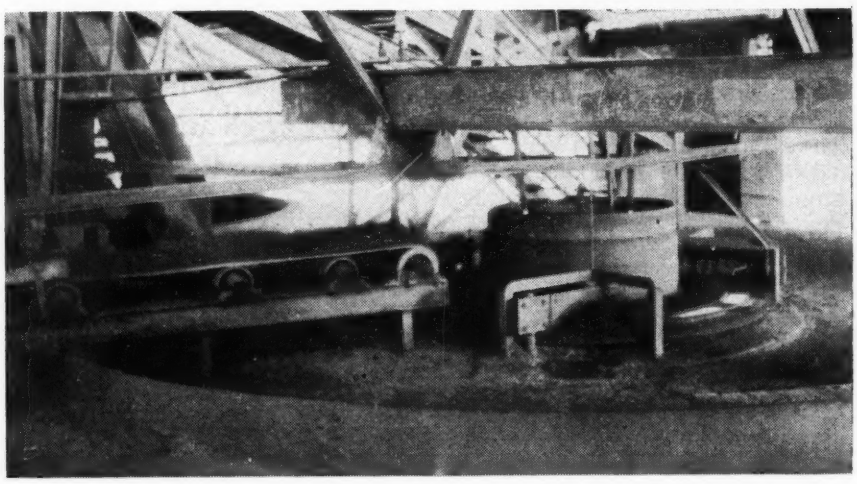
Improved Feeder for Multiple-Hearth Roaster

H. L. JOHNSON, *Assistant Smelter Superintendent, United States Smelting, Refining & Mining Co., Midvale, Utah*

RECENTLY, the Midvale smelter of United States Smelting Refining and Mining Company, at Midvale, Utah, has developed an improved feed arrangement for the Wedge roasters in the plant. Prior to its installation, the feed was discharged by a conveyor belt onto the top hearth of the roaster near the periphery of the roaster shell, subsequently to be mixed and moved toward the feed plates at the center drum by revolving arms fitted with rabbles. The charge was rabbled until it was moved under the top feed plate revolving with the drum, with four blades in the plate, adjusted to suit conditions, directing the charge to a space between the drum and bottom feed plate for discharge to the next hearth below.

The feed used in recent years consisted of baghouse dust and wet concentrates difficult to rabble into the space mentioned, and as a consequence two drop holes were provided about halfway between the drum and the roaster shell through which the material dropped to the next hearth. Because of this change only one half of the drying area of the lower hearth was used. As the charge rabbled on the top hearth, it became slimy, and often an extra operator was required to direct it manually into the drop holes. In addition, the top hearth had to be spaded at least once a week because of the tendency of the material to pack—a somewhat dangerous operation in view of the revolving rabble arms.

To eliminate this difficulty, and at the same time reduce consumption of rabble blades and do away with periodic spading of the top hearth, the feed arrangement in use was replaced with that shown in the accompanying illustration. It involved extension of the feed belt conveyor and removal of the arms and rabbles. The conveyor belt now discharges the material onto a circular table attached to the original top feed plate at the drum. This is made of ¼-in. steel plate, and extends 6 in. respectively inside and outside of the feed plate, resulting in a total width of 12 in. The resultant space between the table and the drum, 11 in. wide and 4 in. deep, is filled with roaster feed, subsequently forming its own bed and being leveled off by three stationary blades.



BELT CONVEYOR feeding top hearth has been extended to deliver material for roasting directly to a circular table attached to top feed plate, this after removal of arms and rabbles

These scrapers are adjustable and are suspended from an angle-iron frame and secured to vertical supports. They are placed at an angle to permit each unit to remove about one-third of the feed. As the table revolves, the blades force the charge into three 9x10-in. drop holes spaced at equal distances at the outside of the table. The material then drops onto the next hearth, where rabbles move it to drop holes at the periphery for transfer to the third hearth. On the second hearth sufficient heat is available for drying the charge and actual roasting commences on the succeeding hearth.

The table proper has a relatively long life, because the blades occasion little or no wear. The blades are made of ½-in. steel plate, measure 8 in. by 2 ft. 10 in., and last about one year before they have to be replaced entirely or the lower edge has to be rectified. Slight wear on the lower edge can be taken up by simply lowering the blades closer to the top of the table.

The arrangement described has given excellent service while handling wet or sticky material. It works equally well on dry charges.

New Iron Area Sought In Northern Minnesota

GEOPHYSICAL WORK with a magnetometer to check on the possibility of the occurrence of a new iron-bearing area in northern Minnesota, in St. Louis County, between the Mesabi Range and Cloquet, approximately 50 miles south, was done in the summer of 1942, following a recommendation to this effect to the Commissioner of Iron Range Resources and Rehabilitation, R. E. Wilson, at St. Paul. It was felt that geological work alone had gone about as far as possible in solving the geology of this area. Results of the survey are given in a recent report (No. 1), made on the project by George E. Schwartz. The work reported on served mainly to outline the problem. Conclusions reached are:

Perhaps the most concrete and obvious result of the work is the definite placing of the west edge of the Duluth gabbro contact between T. 49N., R. 15W., and T. 58 N., R. 14W. This gabbro underlies the western part of Duluth, and stretches north and east for over 100 miles. It contains several differentiates such as titaniferous magnetite, anorthosite, and granite. Its base, or west side, extends generally north from Duluth to the east end of the Mesabi range, thence swinging east. The exact location of the gabbro contact was thought to have much significance. The survey eliminates from further consideration the entire area east of this contact, inasmuch as any magnetite that it may contain is titaniferous and therefore is not at present of commercial interest.

The second conclusion is that the area in St. Louis County between Townships 53N and the Mesabi Range, excepting the projection of the Eveleth anticlinal axis, (Eveleth is on the Mesabi) is definitely lacking in sufficient magnetic attraction.

Third, a great deal of ore has been formed along the Eveleth anticlinal axis at the south and west edge of Eveleth. It has been shown by reconnaissance magnetic work that this axis can be followed by its magnetic effect southwest to Forbes and for some distance beyond. No exploration has been made to Mr. Schwartz's knowledge, beyond the present orebodies. Knowledge of the origin and occurrence of ore on the Mesabi does not encourage the idea that ore would be found along this axis, but caution dictates that such a feature be examined thoroughly.

An area in southern St. Louis County including Townships 50, 51 and 52 N., Ranges 16 to 20 W., is shown to have a broad belt of magnetic attraction. Enough work has been done to indicate the continuity of this belt, but it remains to be mapped in detail. This belt has a trend of about N. 15 W., to S. 15 E. This contrasts with a northeasterly trend for the Cuyuna and Mesabi ranges. This area lies along the northeast projection of the Cuyuna range and the magnetic lines which extend beyond the range proper.

The correlation of these trends remains to be done. Nothing has been done in the area between the northeasterly trends of the Cuyuna and the belt of attraction mapped by the present work, but some work farther north by the Oliver Iron Mining Company suggests that the structure or at least the belts of magnetic attraction near Floodwood form an arc connecting the two areas. This is an inference that needs much checking, and further work has been proposed to the Rehabilitation Commissioner.

Mexico as a Source of Tin

AS A PART of its program of geologic investigations in the American republics, the U. S. Geological Survey recently made a survey of the tin deposits of the Republic of Mexico, the results of which are published in U.S.G.S. Bulletin No. 935-C by William F. Foshag and Carl Fries, Jr. According to the authors, Mexico's tin production is not likely to exceed about 400 tons per year at present prices, although if the price were doubled, production might also be doubled. With regard to the deposits in general, the bulletin reads as follows:

"The tin deposits which are reported to occur in 19 states of the Republic of Mexico are all on the high lava-covered plateau extending from the border with the United States to the State of Oaxaca. They are of three types: (1), deposits associated with granite; (2), deposits associated with lead-zinc-silver ores; (3), deposits closely associated with extrusive rocks. The total production of metallic tin between 1800 and 1940 has probably been somewhat more than 6,000 metric tons; the annual production between 1936 and 1940 has averaged 330 tons. About half the tin came from deposits of type 2, and the rest from type 3; none has yet been mined from deposits of type 1.

The only known deposit of tin associated with granite is that near Guadalcazar, San Luis Potosi, where small amounts of cassiterite are found associated with a granite intruded into a Cretaceous limestone. In themselves, the veins containing the tin have no commercial value, but certain gravels derived from the granite might possibly be worked for their tin content.

Deposits of type 2, associated with lead-zinc ores, are those of the San Antonio mine near Santa Eulalia, Chihuahua. Here, the orebodies are found as replacements in Cretaceous limestones overlain by volcanic rocks and Tertiary clastics; all the rocks are intruded by rhyolite and andesite dikes. Although the San Antonio mine has accounted for about half of Mexico's tin, it is now thought to be exhausted.

The most significant of Mexico's deposits are those found in the volcanic rocks on the large central plateau, mostly in the states of Durango, Zacatecas, and Guanajuato. These occur both as veins and as placer deposits, in or associated with late Tertiary rhyolite flows. None of these deposits has been proved to contain more than 120,000 tons of rock bearing at the most, 0.5 percent tin, and most tonnages are smaller.

At present, the greatest interest is being shown in certain tin placers near Durango City. One mill is now operating in that area and three others are reported to be under construction. American capital is said to be backing these ventures.

How Efficient Is a Flotation Machine?

A. W. FAHRENWALD, *Dean of the School of Mines, University of Idaho, Moscow, Idaho*

★ *As pointed out on page 74 of this issue, present-day flotation machines are sadly lacking in the scientific development which has been given the study of flotation reagents. Dean Fahrenwald is one of the investigators who have at last begun the study of flotation machine fundamentals which must be undertaken if the industry's equipment is to be improved. The interested reader is referred to an article by P. Malozemoff and R. H. Ramsey in E.&M.J. for March, 1941, which was the first approach in the literature to an analysis of this subject.*—Ed.

Two methods of measuring the aërating capacity of self-aërating mechanical flotation machines are here presented. One consists of a tank of substantial volume provided with three outlets. One of these, 1, is connected by means of a rubber tube with the air intake conduit of the flotation cell. Another, 2, is coupled to a suitable source of water supply conveniently by a piece of garden hose. The third, 3, at the top of the tank, is fitted with a manometer tube, using water. The manometer tube is provided with a valve, 4, as shown.

The operation in determining the air intake of the cell is as follows: Start with the manometer valve open. Now run water into the tank by manipulation of the water valve on the garden hose line until the volume of water entering the tank is exactly equal to the volume of free air being taken by the flotation cell. This balance is hit by a test with the manometer valve. When the valve can be completely closed without any change in elevation of the water levels in the manometer U-tube, the volume of water entering the tank is just equal to the volume of air used by the machine. The water hose is now disconnected from the tank and the flow in cubic feet per minute measured. The method is extremely precise.

It is found that a good 500-gram cell in proper operating condition draws about ¼ cu.ft. of free air per minute.

If it be assumed that all the measured energy input to the machine goes into making new bubble (or water) surface, the volume of free air taken by the machine per minute may be used to calculate the size of bubbles, and in turn the number of bubbles. The energy balance is:

Total energy input in ergs = total bubble (water) surface × the surface energy (73) of water.

Total energy input = 50 watts = $50 \times 60 \times 10^7 = 3 \times 10^{10}$ ergs.

$$\text{Total surface} = \frac{432}{0.061} \div \frac{\pi d^3}{6} \times \pi d^2$$

$$= d42{,}500 \text{ sq.cm.}$$

$$\text{Therefore, } d\,(3 \times 10^{10}) = 42{,}500 \times 73$$

$$\text{and, } d = \frac{3 \times 10^6}{3 \times 10^{10}} = 1 \times 10^{-4} \text{ cm.}$$

$$\text{or, } d = 0.001 \text{ mm.}$$

In 432 cubic inches of air, there would be

$$\left(\frac{432}{0.000061} \div 3.1416 \times 0.0012 = \right)$$

1.3×10^{16}, 1/1000 millimeter bubbles.

These figures are slightly on the astronomical side and certainly are not in line with the facts, although facts as to bubble size in flotation are not known.

For purpose of calculation, let us speculate that the bubbles have a mean diameter of 2 mm. The number of 2 mm. bubbles obtainable from 432 cu.in. of air is

$$\left(\frac{432}{0.000061} \div \frac{\pi d^3}{6} = \right)$$

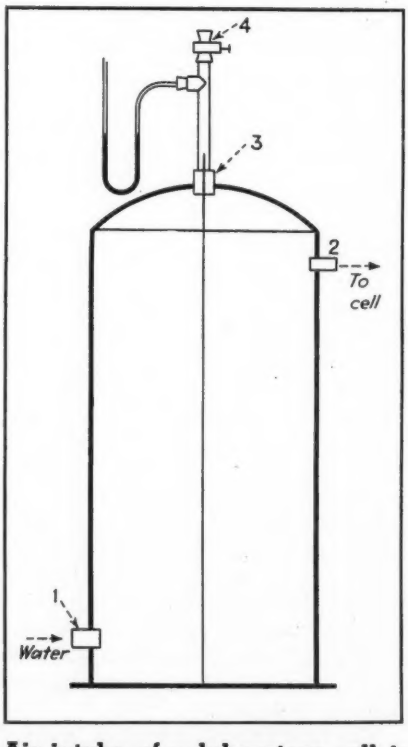
1,740,000. The total water surface is ($1{,}740{,}000 \div \pi d^2 =$) 130,000 sq.cm. per minute, and the total surface energy output of the machine is ($130{,}000 \times 73 =$) 9,490,000 ergs per minute.

The energy input to the machine, as shown above, is 3×10^{10} ergs. Thus, on the assumption that the size of bubble is 2 mm., the mechanical efficiency of the laboratory cell is ($9.49 \times 10^8 \div 3 \times 10^{10} \times 100 =$) 0.31 percent.

It is of interest to note that this efficiency figure is of the same order of magnitude as that of the efficiency of the ball mill. The 500-gram lab cell "grinds" one-fourth of a cubic foot of air per minute at an expenditure of 50 watts. The fineness of grind is anyone's guess, for there is no known available method of "sizing" bubbles.

The method in the foregoing for measuring the aërating capacity of a flotation machine is limited to the study of small experimental units of the self-aërating type. This method is highly accurate, as it measures air intake at zero pressure and it is in this respect that it has merit in research work. The result, however, it should

(*Continued on page 136*)



Air intake of a laboratory cell is measured with this apparatus

TABLE I—Effect of Pulp Depth Upon the Aerating Capacity and Energy Requirement of a Flotation Cell

Depth of Pulp Above Impeller, Inches	Power Input, Watts	Aeration ml. per Sq. In. of Cell Area per Minute
9.5	172	408
7.5	150	423
5.5	120	465
3.5	95	533

TABLE II—Effect of Pulp Density Upon Aerating Capacity and Energy Input Requirement of a Flotation Cell

Pulp Density	Power Input, Watts	Aeration ml. per Sq. In. of Cell Area per Minute
1.11	171	329
1.15	179	286
1.20	180	248
1.25	182	217

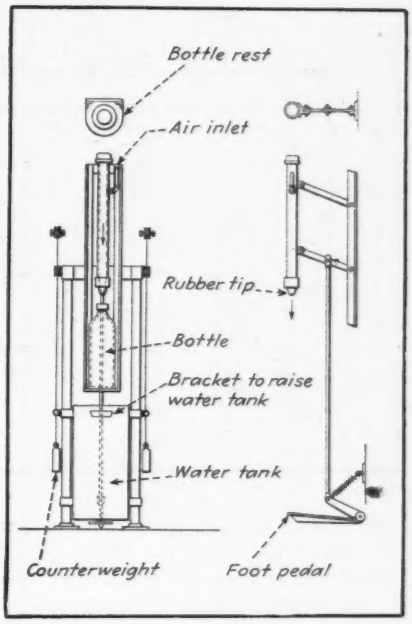
OPERATING IDEAS

Testing Strength of Mercury Flasks

CLEANING and subsequent testing of flasks are two tasks performed periodically in the bottling room of a quicksilver plant. To prevent contamination and leakage of quicksilver, the flasks must be clean inside and devoid of flaws. Both operations are slow if performed by hand.

A simple and relatively inexpensive device that has speeded up materially the testing of flasks at several California quicksilver mines, including the New Almaden and Sulphur Bank, is the bottle-testing machine explained in detail in the accompanying sketch. It can easily be made at the mine machine or repair shop from scrap materials, and essentially consists of a movable water tank and a movable air injector operated by a simple lever mechanism as shown. The water tank operates between two pipe columns, and two counterweights and a welded-on bracket facilitate moving it up and down. The air injector is a short piece of pipe sealed at one end with a cap, and containing a conical rubber tip at the other. Compressed air is introduced through a valve-controlled pipe inlet at the side of the injector. The control mechanism consists of three steel levers, a connecting rod, tension spring, and a foot pedal.

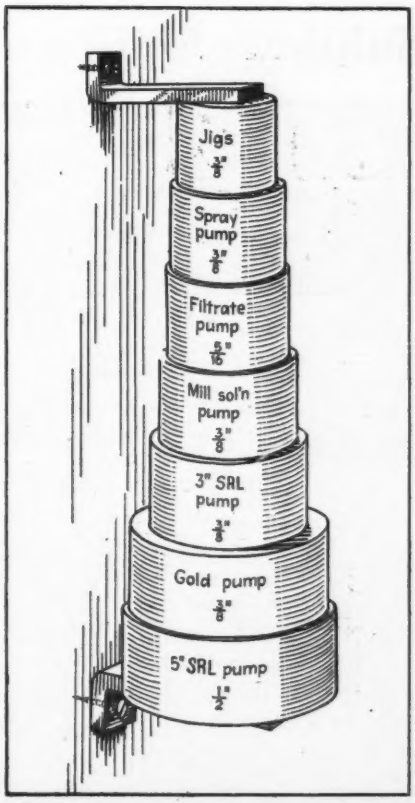
Operation is simple. The flask to be tested is placed on the rest at the bottom of the angle-iron frame welded to the crosspiece at the top of the two pipe tank guides, the conical rubber tip of the air injector pressed into the opening of the flask by pressing down the foot pedal, the air valve opened, and the water tank raised by hand to a point to cover the flask completely. Escaping air bubbles will indicate the location of any leak in the bottle walls or bottom.



Simple Form Speeds Up Pump Gland Packing Replacement

IN ORDER TO GET maximum life out of pump gland packing, the rings of packing should be cut cleanly with beveled edges, the rings should fit the pump shaft accurately, and the joints in adjacent rings should not be in alignment. When this job is done, as it most often is, under pressure to get the pump operating again, the packing rings are likely to be inaccurately cut and then jammed into the pump in a way which will hasten the day of replacement and may even injure the pump.

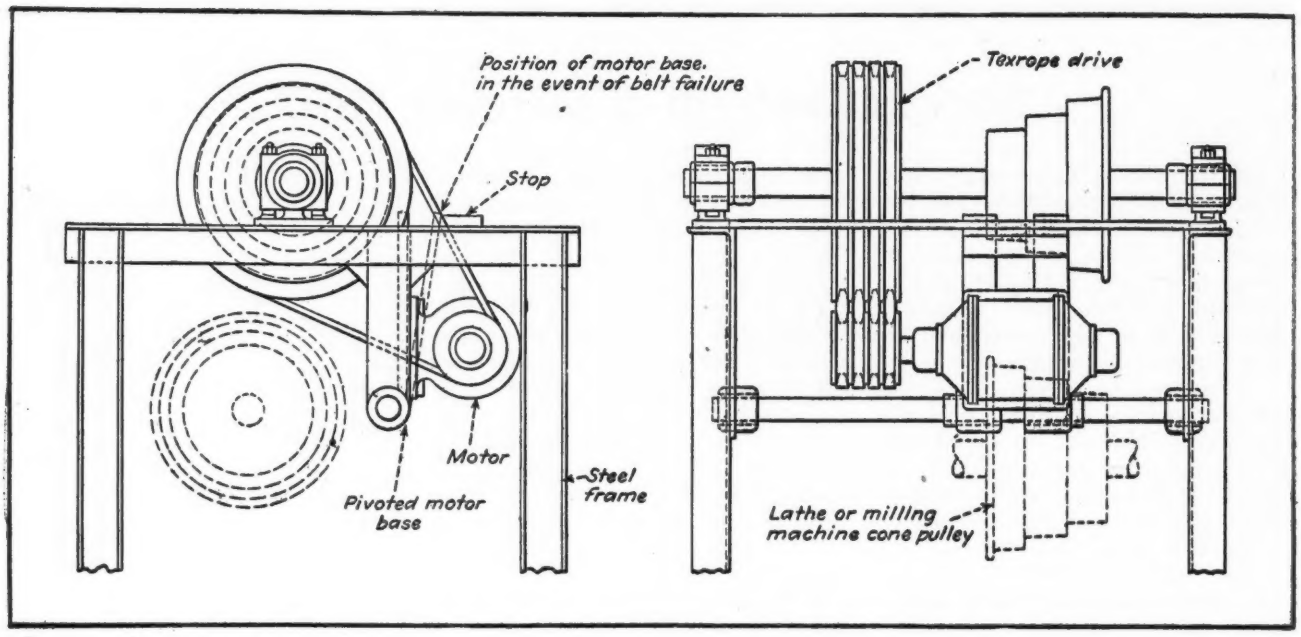
R. A. Sullivan, mill foreman at Preston East Dome Mines, Ltd., South Porcupine, Ont., Canada, reports a method he devised for preparing accurately cut packing in advance of the job. As shown in the accompanying sketch, a form is prepared consisting of round wooden or metal sections, each one of which has been cut to the same diameter as the shaft of one of the mill pumps. When a pump is to be repacked, the packing can be cut on the form at leisure. No time is then lost in fitting the packing rings after the pump is shut down, and the packing job itself is improved.



How Did You Do It?

WERE YOU ever up against a situation which wasn't covered in the textbooks or the instruction manuals? When the plant was down and everybody was standing around waiting for you to decide what to do to get things rolling again? If you have ever thought your way out of a predicament like that, please tell us about it and we'll tell the industry in these pages. That's one of the best ways of insuring the steady progress of the mining industry—the exchange of a fund of solutions to problems which all of us have met and will meet again in the future. If you have ever improvised an emergency repair to a vital piece of equipment, thought up a way to make your job easier or your output greater, revamped your machine to make it last longer, write us a short description of what you did, inclosing a sketch or photograph. E. & M. J. will pay $5 for every such idea used, but some other member of your industry, faced with a problem similar to yours, may find your idea infinitely valuable.

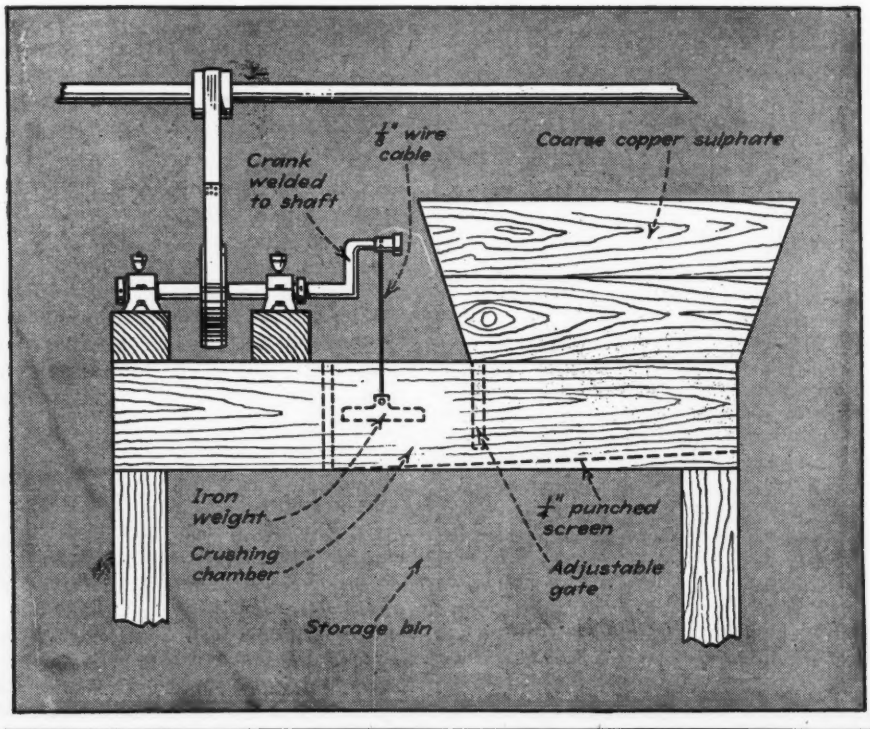
Flexibility Achieved With V-Belt Drive



AN INNOVATION at the machine shop of Miami Copper Co., Miami, Ariz., is the use of a simple individual drive or power transmission arrangement on some metal-working machines formerly driven off a general transmission line. In operation for many months, the drive has proved very satisfactory, and apart from providing more operating flexibility, savings in power and belting have resulted.

As will be seen, the drive is made up of a steel frame placed over the drive end of the lathe, or other metal-working machine, two steel shafts, four bearings, two Texrope pulleys, a cone pulley, and a pivoted or hinged motor base. The slightly tipping motor provides a constant and uniform tension on the V-belts of the Texrope drive. A length of flat iron traversing the end of the steel frame acts as a stop in the event of belt breakage.

Crushing Copper Sulphate for Use as Flotation Reagent



THE MOST COMMON USE for copper sulphate in mill circuits is as an activator for sphalerite in the selective flotation of lead-zinc ores. Robert A. Rice, of Osburn, Idaho, reports that he had been using fine copper sulphate for this purpose, fed with a dry reagent feeder, but that of late he has been able to obtain only a coarse sulphate, too large for the dry feeder.

The difficulty was overcome in the manner shown in the accompanying sketch. The shaft carrying the weight revolves at 80 rpm., and the weight, an iron plate weighing about 10 lb., is suspended from a bronze sleeve slipped over the end of the crank and held by a collar. The reagent is crushed on the ¼-in. screen and drops through into the storage bin underneath.

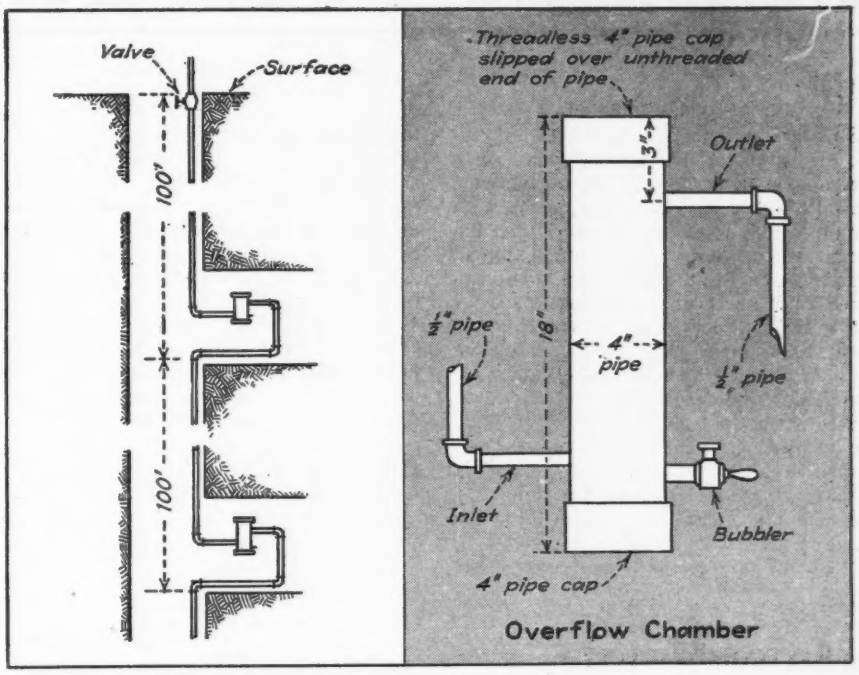
This improvised crusher has been operated only a few hours each week in order to produce the 150 lb. daily of fine copper sulphate which the mill requires. It has also been found useful in crushing lump soda ash.

Supplying Drinking Water in Mines at Low Static Heads

PIPING FRESH WATER into shaft mines for drinking purposes can be somewhat of a problem because of the static head developed in vertical piping. P. C. Ziemke, Milwaukee, Wis., has sent in a sketch of a mine bubbler system which he says is inexpensive to install and is both effective and trouble-free.

The loosely fitting cap on the 4-in. nipple permits entrapped air to escape readily and prevents surges that would otherwise develop. The inlet valve on the surface is opened only wide enough to supply the number of fountains in the system. The sketch shows only station installations, but lateral lines can be run out to remote workings if desired.

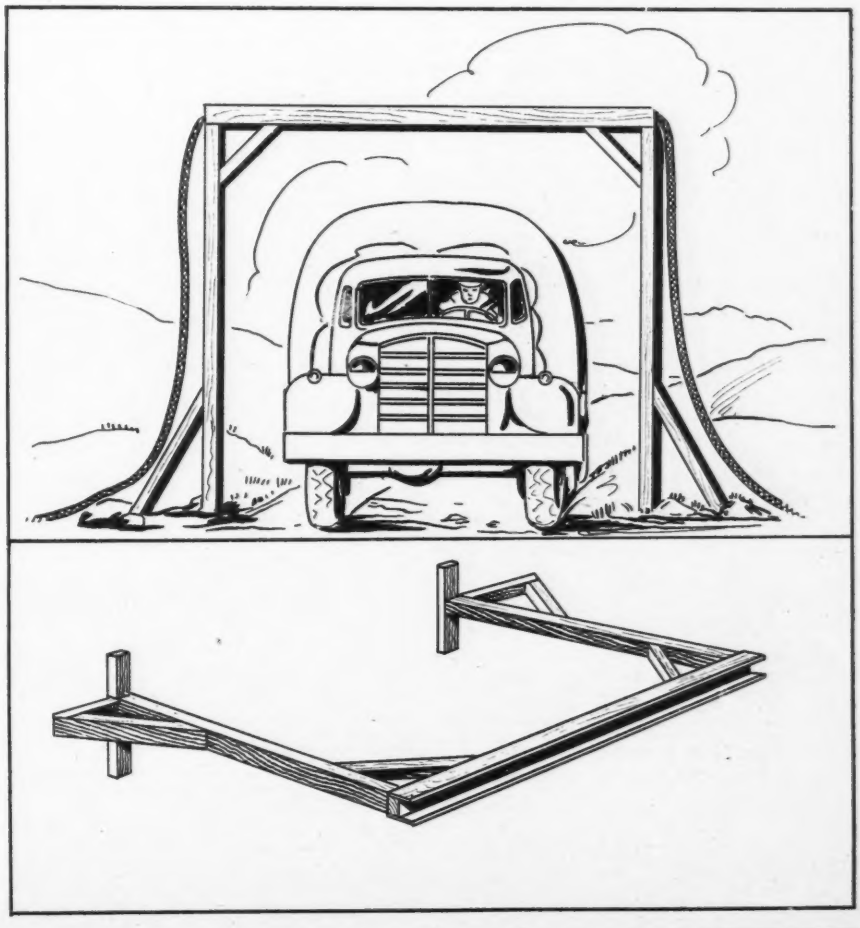
In practice wooden or steel barrels are placed under the bubblers to catch waste water, which can then be dipped out for various uses about the mine —for example, to fill buckets for fire protection.



Portable Rack Provides Safe Cable Crossing

STRUNG ABOUT the Spruce Pit of Oliver Iron Mining Co. at Eveleth, Minn., are numerous electric cables which carry power to the shovels, used for loading ore into trucks, and to other equipment. Because these cables must necessarily cross the truck haulage roads at various points, and because these crossing points are constantly shifting as the shovels change location, it was necessary to devise some convenient method of accomplishing this crossing which would be portable yet which would protect valuable cable against breakage.

The light wooden rack shown in the accompanying sketch provided the solution. Of a height and width sufficient to allow trucks to pass freely under it, the rack has a slot across the top which holds a cable firmly in place. When it is desired to carry a cable over a road, the rack is placed on its side across the road and the cable is anchored in place. The rack is then raised to the position shown, carrying the cable with it to a place of safety.



Power cable can be carried across a haulage road safely by attaching it to a rack (lower), then raising the rack (upper) to clear traffic

MARKET SUMMARY

So FAR AS market developments were concerned, the month of December proved to be a quiet affair. Contrasted with the same month a year ago, most base metals have moved from a position of scarcity and uncertainty to one of ample supply for all possible war requirements. As 1943 ended, the chief worry in the market place was that surplus stocks might increase too rapidly to maintain price stability in the industry. Progress in handling postwar stockpiles was regarded as altogether too slow. Production of aluminum, magnesium, quicksilver, antimony, moylbdenum, tungsten, and other miscellaneous metals is being restricted because of an accumulation in supplies. Output of copper, lead, and zinc, however, remains at a high level.

Censorship regulations were eased during the month, permitting publication of statistics for copper, zinc, lead, quicksilver, and the light metals. Figures released so far disclosed little that was not known to members of the industry, and the news created no excitement marketwise. The zinc statistics showed that stocks increased from 68,268 tons at the end of 1942 to 159,853 tons at the end of November, 1943. Most of the large surplus consists of metal owned by the Government. Both the copper and lead statistics issued so far report on industry-owned stocks only. Moreover, with foreign supplies of copper and lead coming into the country in volume to supplement domestic supplies, the figures on domestic production tell only part of the story.

Copper appeared to be plentiful, owing to smaller deliveries scheduled for January. Domestic copper was granted priority in supplying the needs of industry, and foreign copper is to be stockpiled should the surplus for the month be large.

Lead transactions were in good volume, and the industry is convinced that domestic consumption is holding at between 65,000 and 70,000 tons a month. About 17,000 tons of foreign-origin lead will be released by MRC for domestic consumption during January. WPB altered its regulations to permit consumers to make quarterly reports instead of monthly reports, to "save on paper work."

Tin was in the news because of a political upheaval in Bolivia. A new régime announced that it would cooperate with the United States in every way and carry out

Major Metals

U.S. DAILY AND AVERAGE PRICES

1943	Electrolytic Copper		Straits Tin	Lead		Zinc
Dec.	Domestic (a) Refinery	Export (b) Refinery	New York	New York	St. Louis	St. Louis
1	11.775	11.700	52.000	6.50	6.35	8.25
2	11.775	11.700	52.000	6.50	6.35	8.25
3	11.775	11.700	52.000	6.50	6.35	8.25
4	11.775	11.700	52.000	6.50	6.35	8.25
6	11.775	11.700	52.000	6.50	6.35	8.25
7	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
9	11.775	11.700	52.000	6.50	6.35	8.25
10	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
13	11.775	11.700	52.000	6.50	6.35	8.25
14	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
16	11.775	11.700	52.000	6.50	6.35	8.25
17	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
20	11.775	11.700	52.000	6.50	6.35	8.25
21	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
23	11.775	11.700	52.000	6.50	6.35	8.25
24	11.775	11.700	52.000	6.50	6.35	8.25
25			Holiday			
27	11.775	11.700	52.000	6.50	6.35	8.25
28	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
30	11.775	11.700	52.000	6.50	6.35	8.25
31	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR MONTH			
Dec.	11.775	11.700	52.000	6.50	6.35	8.25
			AVERAGES FOR WEEK			
Dec.						
1	11.775	11.700	52.000	6.50	6.35	8.25
8	11.775	11.700	52.000	6.50	6.35	8.25
15	11.775	11.700	52.000	6.50	6.35	8.25
22	11.775	11.700	52.000	6.50	6.35	8.25
29	11.775	11.700	52.000	6.50	6.35	8.25
			CALENDAR WEEK AVERAGES			
Dec.						
4	11.775	11.700	52.000	6.50	6.35	8.25
11	11.775	11.700	52.000	6.50	6.35	8.25
18	11.775	11.700	52.000	6.50	6.35	8.25
25	11.775	11.700	52.000	6.50	6.35	8.25

Gold, Silver, Sterling

DAILY AND AVERAGE PRICES

1943	Sterling Exchange		Silver		Gold	
Dec.	"Checks" (Nominal)	"90-day demand"	(c) New York	London	London	(d) United States
1	401.000	(f)	44.750	23.500	168s	$35.00
2	401.000	(f)	44.750	23.500	168s	35.00
3	401.000	(f)	44.750	23.500	168s	35.00
4	401.000	(f)	(e)	(e)	(e)	35.00
6	401.000	(f)	44.750	23.500	168s	35.00
7	401.000	(f)	44.750	23.500	168s	35.00
8	401.000	(f)	44.750	23.500	168s	35.00
9	401.000	(f)	44.750	23.500	168s	35.00
10	401.000	(f)	44.750	23.500	168s	35.00
11	401.000	(f)	(e)	(e)	(e)	35.00
13	401.000	(f)	44.750	23.500	168s	35.00
14	401.000	(f)	44.750	23.500	168s	35.00
15	401.000	(f)	44.750	23.500	168s	35.00
16	401.000	(f)	44.750	23.500	168s	35.00
17	401.000	(f)	44.750	23.500	168s	35.00
18	401.000	(f)	(e)	(e)	(e)	35.00
20	401.000	(f)	44.750	23.500	168s	35.00
21	401.000	(f)	44.750	23.500	168s	35.00
22	401.000	(f)	44.750	23.500	168s	35.00
23	401.000	(f)	44.750	23.500	168s	35.00
24	401.000	(f)	44.750	23.500	168s	35.00
25			Holiday			
27	401.000	(f)	44.750	Holiday	Holiday	35.00
28	401.000	(f)	44.750	23.500	168s	35.00
29	401.000	(f)	44.750	23.500	168s	35.00
30	401.000	(f)	44.750	23.500	168s	35.00
31	401.000	(f)	44.750	23.500	168s	35.00
			AVERAGES FOR MONTH			
Dec.	401.000	.....	.....	.....	....	35.00
			AVERAGES FOR WEEK			
Dec.						
1	401.000	.....	44.750	.....	....	.....
8	401.000	.....	44.750	.....	....	.....
15	401.000	.....	44.750	.....	....	.....
22	401.000	.....	44.750	.....	....	.....
29	401.000	.....	44.750	.....	....	.....

Calendar week averages, New York Silver: Dec. 4, 44.750; 11th, 44.750 18th, 44.750; 25th, 44.750.
(e) Not quoted (Saturday). (f) No quotations.

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis, as noted. All prices are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.255c. per pound, the average differential for freight and delivery charges.

(b) Export prices are net at refineries on the Atlantic seaboard and include sales of domestic copper in the foreign market. Owing to the World War and the disruption of normal trade relations, our export copper quotations, since September, 1939, have been based largely on f.a.s. transactions, ex United States ports. We deduct .05c. from the f.a.s. basis (lighterage, etc.) to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only

Quotations for copper are for the ordinary forms of wirebars and ingot bars; cathodes are sold at a discount of 0.125c.

Quotations for zinc are for ordinary Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West in nearly all instances command a premium of 1c. per pound over the current market for Prime Western but not less than 1c. over the *Engineering and Mining Journal's* average quotation for Prime Western for the previous month.

Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

(c) Silver other than newly-mined domestic, by Handy & Harman. Under Treasury order of July 6, 1993, the price on domestic newly-mined silver mined subsequent to July 1, 1939, was fixed at 71.11c. per troy ounce. Handy & Harman's quotations on newly-mined domestic silver, 999 fine was 70⅝c. throughout December.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold in domestic and imported ore or concentrate is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

its obligations in reference to supplving tin and other minerals. The revolutionary party, led by Victor Paz Estenssoro, former finance minister, declared that "internal policy will be directed to improving the welfare of the working class." Before the month ended, Bolivian representatives said that negotiations aiming at a higher price will be renewed. A higher price is needed, according to Bolivian authorities, to improve the social and working conditions of the miners.

Quicksilver developed further weakness, spot material being available at $180 per flask in the New York market, a reduction of $2. The demand for the metal was dull as the year ended, with little or no interest in forward material. Production is expected to be lowered. Cobalt, molybdenum, tungsten, and vanadium are to be freed from allocation early in 1944. The four elements are in ample supply and producers now are concerned with expanding outlets under the war program. War demands for nickel have been met, despite trying labor conditions. Production in 1943 will approximate the record high of 1942.

Miscellaneous Metals Monthly Averages

Average prices of miscellaneous metals for February and March:

(a) New York, packed in cases, in lots of 5 tons or more but less than a carload. (b) Nominal. (c) Producer's price for commercial sticks. (d) Average producers' and platers' quotations. (e) Special shapes sold to platers.

	Nov.	Dec.
Quicksilver, N. Y. flask	193,696	190,077
Antimony (a)	15.839	15.839
Antimony, bulk, Laredo.	14.500	14.500
Antimony, bulk, N. Y.	15.265	15.265
Antimony, Chinese (b).	16.500	16.500
Platinum, oz. troy	35.000	35.000
Cadmium (c)	90.000	90.000
Cadmium (d)	92.500	92.500
Cadmium (e)	95.000	95.000
Aluminum, ingot	15.000	15.000

E & M J Price Index

Weighted index of non-ferrous metal prices (copper, lead, zinc, tin, silver, nickel, and aluminum). The average for the years 1922-1923-1924 equals 100.

1929	110.33	1936	73.45
1930	82.87	1937	90.86
1931	60.20	1938	73.67
1932	48.26	1939	77.71
1933	59.79	1940	79.22
1934	69.59	1941	83.49
1935	74.66	1942	86.80

	1941	1942	1943
January	82.48	85.39	88.74
February	82.76	85.90	88.74
March	83.27	85.90	88.74
April	83.48	85.90	88.74
May	83.51	85.90	88.74
June	83.48	85.90	88.74
July	83.60	85.90	88.74
August	83.39	85.90	88.74
September	83.34	88.74	88.74
October	83.84	88.74	88.74
November	84.32	88.74	88.74
December	84.42	88.74	88.74

Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York, unless otherwise stated

(Jan. 1, 1944)

MISCELLANEOUS METALS

Aluminum, ingot, 99 plus per cent, lb	15c.
Antimony, domestic, spot, lb. 5 tons or more	15.839c.
Bismuth, ton lots, lb	$1.25
Cadmium, commercial sticks, lb	90c.
Calcium, lb., ton lots 97 @ 98 per cent	$1.25
Chromium, 97 per cent grade, lb	89c.
Cobalt, 97 to 99 per cent, per lb	$1.50
Nickel, electrolytic cathodes, lb	35c.
Magnesium, 99.8 per cent, carloads, lb	20½c.
Palladium, troy oz	$24.00
Platinum, (Official quotation) troy oz	$35.00
Quicksilver, flask of 76 lb., 100 flasks or more	$180.00@$182.00
Radium, mg. radium conten	$25.00@$30.00
Selenium, 99.5 per cent, lb	$1.75
Silicon, minimum 97 per cent, spot, carloads, lb	14.75c.
Tellurium, lb	$1.75
Thallium, 100 lb. or more, lb	$10.00
Titanium, 96 to 98 per cent, lb	$5.00

METALLIC ORES

Beryllium Ore, 10 to 12% BeO. f.o.b. mines, ton	(b)$190.00@$193.00
Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry, 48% Cr_2O_3, 2.8 to 1 ratio	$41.00
48% Cr_2O_3, 3 to 1 ratio	$43.50
Iron Ore, Lake Superior, Lower Lake ports, long ton:	
Old Range bessemer	$4.75
Mesabi bessemer	$4.60
Old Range non-bessemer	$4.60
Mesabi, non-bessemer	$4.45
Lead (Galena) 80 per cent, Joplin, Mo., ton	$76.54
Manganese (dutiable) f.o.b. cars Atl. ports, long ton unit Mn:	
50 per cent	79.8c.
48 per cent	78.8c.
46 per cent	76.8c.
Manganese Ore, domestic, 48%, f.o.b. MRC depot, l.t. unit	$1.00
Molybdenum Ore, 90%, per lb. of MoS_2, f.o.b. mines	45c.
Tungsten Ore, per unit of WO_3:	
Chinese, 65 per cent, duty paid	(b) $24.00
Domestic, 65 per cent and upward	(a) $26.00
Vanadium Ore, per lb. of con tained V_2O_5 f.o.b. mines	27.50c.
Zinc Ore, Prime, 60 per cent concentrate, Joplin, Mo.; per ton	$55.28

(a) Prices at mines, small lots, usually several dollars less. (b) Nominal

METALLIC COMPOUNDS

Arsenious Oxide (arsenic) lb	4c.
Cobalt Oxide, 70 @ 71 per cent, lb	$1.84
Copper Sulphate, 100 lb	$5.00

ALLOYS

Beryllium Copper, 2.5 to 3 per cent Be, per lb. of contained Be	$15.00
Ferrochrome, 65 @ 70 per cent per pound of Cr contained	13c.
Ferromanganese, 78 @ 82 per cent, gross ton	$135.00
Ferromolybdenum 55 @ 65 per cent Mo. lb. of Mo. contained	95c.
Ferrosilicon, 50 per cent, per lb. of contained Si	6.65@8.10
Ferrotungsten, 75 @ 80 per cent, lb. of W contained	$1.90
Ferrovanadium, per lb. of V, delivered	$2.70@$2.90
Silicomanganese, 1 per cent C, gross ton	$133.00

NON-METALLIC MINERALS

Asbestos, f.o.b. Canadian (Quebec) mines (U. S. funds), ton:	
Crude No. 1	$650@$750
Crude No 2	$165@$385
Spinning fibers	$124@$233
Paper stock	$44@$49.50
Shorts	$14.50@$26.50
Vermont, f.o.b. Hyde Park:	
Shingle stock	$62.50@$65.00
Paper stock	$44.00@$53.00
Shorts	$14.50@$28.50
Floats	$19.50
Barytes, long ton:	
Georgia, crude	$8.50@9.00
Missouri, 93 per cent $BaSO_4$, less than 1 per cent iron	$6.75@$7.25
Bauxite, long ton:	
Domestic, crude, 50 @ 52 per cent (not dried)	$5.00
Domestic, chemical, 55 @ 58 per cent	$7.50@$8.50
Domestic, abrasive, 80 @ 84 per cent	$16.00
China Clay, f.o.b. mines, ton:	
South Carolina and Georgia, No. 1, bulk	$6.75@$8.00
Delaware, No. 1	$15.00
Feldspar, bulk, ton:	
Potash feldspar, 200 mesh	$17.00
Glass-spar, white, 20 mesh	$11.75
Fluorspar, f.o.b. mines, bulk, Kentucky and Illinois 85-5 per cent, all rail movement, ton	$33.00
Acid 98 and 1 per cent, bulk, ton	$37.00
Fuller's earth, f.o.b. Georgia or Florida, ton	$7.00@$14.00
Magnesite, per ton dead-burned, f.o.b. Washington	$22.00

Mica—Base prices on sheet, North Carolina one-half trim, as posted by the Colonial Mica Corp., the Government's buying agency for obtaining strategic mica, per pound, follow: Sheet to cut minimum of 1¼ × 2 in. $2.40; 2 × 2 in. $3.52; 2 × 3 in. $4.64; 3 × 3 in. $5.12; 3 × 4 in. $6.08; 3 × 5 in. $7.04; 4 × 6 in. $8.00; 6 × 8 in. $9.12; punch, 30c. Premium and discounts up to 40 per cent, depending on quality and trim. Scale does not apply to non-strategic mica.

Ocher, Georgia, ton	$19.00@$22.00
Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports	12c., nom.
Silica, in bags, 325 mesh. ton	$20.00@$40.00
Sulphur, Texas, mines, long ton	$16.00
Talc, f.o.b. works, ton:	
New York, double air-floated, 325 mesh	$12.00@$15.00
Vermont, extra white, 200 mesh	$9.50@$10.50
Tripoli, Missouri, ton:	
40 mesh, cream colored	$14.50
200 mesh, cream colored	$26.00

IRON AND STEEL

Pig Iron, Valley furnaces, gross ton: Basic	$23.50
Steel, base prices, Pittsburgh Billets, gross ton	$34.00
Structural shapes, 100 lb	$2.10

WASHINGTON REFLECTIONS

McGRAW-HILL WASHINGTON NEWS BUREAU

Bunker Will Direct WPB Mineral Program

Just after Christmas announcement was made of a reorganization of command of WPB's mineral branches. All the mineral agencies, including the Steel, Copper, and Aluminum-Magnesium divisions, the Minerals Bureau (controlling Zinc, Tin-Lead, Mica-Graphite, and Miscellaneous Mineral divisions) and the Mineral Resources Coordinating Division, are now grouped under a new WPB Vice-Chairman for Metals and Minerals. Appointed to the new position is A. H. Bunker, former director of the Aluminum-Magnesium Division, who is succeeded in this post by Philip D. Wilson, his former deputy. Inasmuch as WPB is likely to play an important part in the painful adjustments that will be required in fitting the mining industry to its peacetime functions, the industry can congratulate itself that the new vice-chairman is a man of proven executive ability and an adherent of the private enterprise system. Prior to joining WPB Mr. Bunker was executive vice-president of Lehman Corp. He is a past president of the Carib Syndicate and of U. S. Vanadium Corp., and was active in the formation of the Potash Company of America.

There is no change in the heads of the various mineral agencies grouped under Mr. Bunker. However, H. O. King, director of the Copper Branch, has announced that he will resign effective Feb. 1.

Labor Pressure May Loosen Mineral Curbs

For the past several weeks there has been considerable discussion in WPB industry committees over relaxation of the allocation and limitation orders affecting several minerals whose supply has overtaken war requirements. Pressure arises from several sources, from consumer industries, from producer anxiety over competition, and from a desire on the part of the private-enterprise minded to loosen government shackles on business before a change in the political trend fixes them permanently. One result has been the recently announced intention to abandon allocations for cobalt, molybdenum, and vanadium.

A factor which is likely to have a profound effect in loosening up the supply of raw materials to industries serving civilian consumption is the great uneasiness in the ranks of organized labor over possible unemployment due to cutbacks in production of war materiel. Despite statements of government officials to the contrary, labor organizations see unemployment looming up in several quarters. Considering the sensitivity of politicians to the wishes of labor leaders, this anxiety of labor is likely to produce effective pressure from the top that will liberalize WPB policies governing raw materials.

Stockpile Bill Revised in Several Respects

A new stockpile bill was introduced by Senators Scrugham, Murray, Johnson, and Maybank in early December. The new bill, S. 1582, is based on information developed from the hearings held on the Scrugham bill, S. 1160.

The first stockpile bill was revised and amended many times, and was the object of adverse criticism from several quarters. By permitting S. 1160 to die it is hoped that the antagonism which it engendered can be buried with it. For this reason it was not reported out of committee during the first session, and a new bill was prepared to take its place.

The new stockpile bill differs from the previous versions in a number of ways. It would set up a control board composed of five members of the mining industry to be appointed by the President "with the advice and consent of the Senate." The board would estimate the quantities of strategic minerals to be stockpiled that will be sufficient for a future total war lasting three years.

A new feature inserted in the measure provides for "the rotation of mineral stockpiles where necessary to prevent deterioration." There are only a few minerals which might require this new provision.

According to committee spokesmen, the greatest care has been exercised in the wording of the new measure to prevent the dumping of government-owned stocks. Section 4 provides that all stockpiles and existing contracts excepting those of the War and Navy departments shall be transferred to the Metals Reserve Co. This would take care of any foreign commitments of the government. This section would provide that the Army and Navy may not dispose of minerals in their possession except to other departments of the government, thus keeping them off the general market.

Section 5 provides that disposal of the stockpile shall be only as Congress shall direct, instead of the President, as was written into previous versions.

To provide a reasonable time for the accumulation of stockpiles, a period of five years is authorized in the new measure.

To protect marginal producers for a year following the war, a paragraph has been retained which would make it mandatory to purchase the offerings of small or marginal domestic operators at the higher of either the highest OPA ceiling prices or the highest prices paid by any government agency to the particular mine during the war. The thought behind this provision is that much distress can be averted at very small cost. After the first year, the board is instructed to pay domestic producers whatever price up to 25 percent over the import price, duty paid, that will permit adequate production to fulfill the objectives of the bill.

A new clause requires that "any minerals acquired by the United States under lend-lease repayments shall be added to the stockpiles."

Provision is made for the refining of metals for the stockpile by contract. This was put into the bill with the idea that private operators might lease and operate government plants under contract to Metals Reserve Co. Operation of the Texas tin smelter might be continued in this way. It was also felt by those writing the bill that operations under this section would have a stabilizing influence on the smelting industry. Contract operations could be entered into during periods of business inactivity.

The board is made the policy-making body by Section 8 of the bill, which also provides that the Metals Reserve Co. shall be the administrative agency. The Reconstruction Finance Corp. is directed to provide the necessary funds to carry out the terms of the bill.

Interruption of Bolivian Tin Flow Is Unlikely

Unofficial opinion in Washington is to the effect that the recent upheaval in the Bolivian government will not affect the supply of tin moving to this country. Without discussing the pros and cons of Bolivia's internal problems, Washington officials point out that the Bolivian economy is chiefly dependent on the export of tin and a few other mineral products. The United Nations are Bolivia's only customers, and Bolivia must have United Nations' cash in order to function. It was considered by these officials to be significant that, simultaneously with the revolution, Bolivian representatives in this country presented a request for higher tin prices.

It is believed that the present political disturbances in Bolivia were caused by the same maladjustment that resulted in the strikes in the Bolivian tin mines reported in this column a year ago (*E.&M.J.*, January, 1943, p. 42). At that time it was pointed out that foodstuffs to support the miners must be imported and paid for in foreign exchange built up by export of mineral products. The surrounding countries which supply the foodstuffs have been experiencing price increases commensurate with rises in the price of tin, so that increases in wages for Bolivian miners have not improved their ability to buy food. The report of the commission which

investigated Bolivian labor and living conditions (*E.&M.J.*, May, 1943, p. 90) noted that despite substantial increases, the "real" wages of Bolivian mine workers have declined. Under these conditions, agitators have had fertile soil in which to sow discontent among wage earners, thus paving the way for revolt.

Percentage Depletion Gains in Tax Bill

The Senate Finance Committee reported on the Revenue Bill of 1943 just before Congress recessed for the holidays. Generally speaking, the Finance Committee concurred with previous House action. The bill that the Senate will consider contains a few changes from the House version which will be particularly interesting to the mining industry. The committee report explains these changes, which have to do with percentage depletion and the exemption from excess profits tax for certain strategic minerals. The report reads as follows:

"Under the House bill, percentage depletion is extended to flake graphite, vermiculite, potash, beryl, feldspar, mica, lepidolite, and spodumene, in addition to those minerals presently receiving it, and discovery depletion is consequently terminated with respect to these minerals. The extension to flake graphite applies to years beginning after Dec. 31, 1942, but the extensions made by this bill and the Revenue Act of 1942 are limited to the duration of the war.

"Your committee makes three changes in this provision. It includes . . . talc, and in the case of potash, it reduced the rate from 23 percent to 15 percent and makes the allowance permanent and not limited to the duration of the war."

Section 207. Strategic Minerals

"This section is identical with Section 207 of the House bill. It amends section 731 of the code relating to the exemption from excess profits tax of the portion of the adjusted excess profits net income attributable to the mining in the United States of certain strategic minerals so as to extend the benefits of such section to corporations mining fluorspar, flake graphite, and vermiculite. The portion of the adjusted excess profits net income attributable to strategic mining is determined according to detailed regulations as contemplated by the section. As in the House bill, the amendment made with respect to flake graphite is applicable to taxable years beginning after Dec. 31, 1942."

Jones Testifies on Contracts, Stockpiles

Termination of contracts continues to be one of the hottest subjects of conversation in Washington. Government policy of great interest to the mining industry was given in the testimony of Jesse Jones, Secretary of Commerce and director of the RFC, before a subcommittee of the Senate Military Affairs Committee early last November. The importance of remarks of Secretary Jones seem to have been generally overlooked.

Although it is frequently misleading to quote isolated paragraphs of testimony, many of the questions and answers are very clear-cut and will stand alone. A few of them follow:

"Senator Murray. What principles and policies do you follow at the agency in the adjustment of claims upon terminated contracts and what kind of contract terminations office, if any, have you set up?

"Mr. Jones. The programs and contracts vary to such an extent that they cannot readily be treated on a single basis. Moreover, we have had a relatively small amount of cancellations requested by the war agencies.

"It has been our policy to negotiate settlements on the basis of what is fair to the government and also to the manufacturer, and we have had no difficulty in reaching agreements.

"In this connection we have also been concerned with the need for speed and for prompt advances pending final settlements. That is, if the contractor needs some advance, we make it. It has been our experience that frequently the advances and progress payments made on a contract adequately protect him for his cash position on the termination. We have really had no trouble about any of them. . .

"Senator Murray. I am very much interested in the situation of these small mine owners that may be affected by termination of contracts. Have you already terminated those contracts to any considerable degree?

"Mr. Jones. Not much. We have had requests from the War Production Board to stop some few contracts, stop production of this, that, and the other material, but we have done very little at it, and we do not intend summarily to shut a man off and let him go hungry, because most of this material that you speak of, it does not deteriorate——

"Senator Murray. That is right.

"Mr. Jones. A little extra stockpiling is not awfully serious.

"Senator Murray. So it cannot be lost; it is not entirely devoted to war purposes.

"Mr. Jones. No; if it becomes necessary to reduce the production of a particular item, our thought has been made to give each fellow a half loaf, let him begin to cut down. Instead of cutting 100 percent of his capacity, let him cut 60, 50, 40, or whatever——

"Senator Murray. Yes.

"Mr. Jones. I think we can break the fall by doing it that way.

"Senator Murray. You are finding now no difficulty in supplying most of the strategic and critical minerals. Is there any scarcity now of any of those metals?

"Mr. Jones. Senator, I think I am safe in saying that there is not a single item of critical material needed in the war effort that is not available. Now we could have more of some things than we have, but there has been no lack of material to do anything that it is necessary to do in the war effort, from the beginning up to now, and our stockpiles are increasing."

Order P-56 Extended to Mines and Smelters

A Christmas edition of Preference Rating Order P-56 brought all the mining industry under the terms of that order. Mines, smelters, and certain South American copper producers now operate under P-56, as orders P-58 and P-73 were revoked. Under the terms of P-56 as amended Dec. 24, the definition of "producer" includes the operations formerly covered by Order P-58 and P-73, and specifically excludes "any enterprise defined as a non-essential mine in Order L-208 or any like enterprise located outside of the United States, its territories or possessions."

Most important revision of the order was the easing of the restrictions on capital additions. Capital additions not exceeding $500 "for one complete capital addition" were included in the definition of "maintenance, repair and operating supplies." Such additions may not be subdivided to bring them under the provisions of the order.

According to the amended order, "for the first and second quarters of 1944 a dollar value quota for the purchase of minor capital additions . . . may be applied for by letter filed with the Mining Division of the War Production Board prior to January 24, 1944." After the second quarter, applications for a special quota for minor capital additions should be made on the appropriate form as listed in the order.

Inventory provisions for smelters and refiners are the same as those previously applied to mines.

Other provisions of the amended order include:

1. Sale of excess or idle materials covered in Priorities Regulation 13 is now permitted.

2. Producers operating under P-56 are granted the same privileges given to persons operating under Priorities Regulation 5 by other orders of the War Production Board. It is specifically stated that mine operators may not obtain any materials under CMP Regulation 5. These points are fully covered in paragraph (j) (1).

3. Mines and smelters desiring to obtain machinery or equipment must make prior application to the Mining Division of the War Production Board. For authorization to buy MRO supplies, where a preference rating is necessary, they must also make prior application.

Serial numbers issued under orders P-58 and P-73 which were not cancelled before Dec. 24, 1943, will continue in force as serial numbers under P-56.

Net result of the consolidation of the repair and maintenance orders of the mining industry should be a considerable simplification of work both in and out of Washington.

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Correction—In last month's Reflections it was erroneously stated that parties seeking to obtain tin should apply to Metals Reserve Co. Applications for tin should be directed to the Tin-Lead Division of WPB, Erwin Vogelsang, director.

NEWS OF THE INDUSTRY

Favors Postwar Leasing Of Government Plants

Appearing before a Senate committee on expenditures recently, Jesse Jones, Secretary of Commerce, suggested that government-owned plants be disposed of after the war by leasing them to private owners rather than by a quick sale. Leases, Jones said, should run for five years, with an option to buy. Ownership of aluminum and magnesium plants, he felt, should be spread sufficiently to maintain competitive conditions among producers.

United States capacity of aluminum metal now amounts to 1,100,000 tons annually, of which the government owns slightly more than half. Most aluminum plants are owned or operated by Aluminum Co. of America; two are owned by Reynolds Metals Corp., and one is owned by Olin Corp. Jones estimated the postwar demand for aluminum at 450,000 tons annually.

The government owns 94 percent of present magnesium-producing capacity; Dow Chemical Co. is the only private producer. The government plants are being operated by a number of companies. Dow Chemical, Anaconda Copper, Union Carbide, National Lead, International Minerals & Chemical, and Ford Motor are among them. The capacity of existing plants is above 210,000 tons of magnesium annually, but actual production will be about 170,000 tons, because requirements of magnesium have not been as great as was originally anticipated. High-cost plants, according to Jones, will be shut down in the postwar period or diverted to other uses. Although cost figures have been released by no magnesium plants in this country, it is reliably reported that most of them must certainly be regarded as high-cost plants if the present price of magnesium is taken as a standard.

It is regarded by many observers as a distinct possibility that the lowest-cost government-owned aluminum and magnesium plants may be operated after the war as measuring sticks to establish prices.

Manpower the Problem, Mining Congress Hears

Speaking at the 46th annual meeting of members of the American Mining Congress held in New York on Dec. 15, Lt.-Col. K. D. Pulcipher, of the Selective Service Bureau, warned his audience that the present manpower situation is not likely to improve. He advised members of the mining industry to expand and improve their training activities in order to make the best use of the limited supply of manpower available.

The customary annual reports were read by the secretary, the treasurer, and the heads of the important committees. Directors elected at the meeting for a three-year term were: E. J. Burnell, V. P. Geffine, James R. Hobbins, Neil W. Rice, Merrill E. Shoup, Grant Stauffer, and Howard I. Young. Immediately after the members' meeting, the directors elected the following officers: Howard I. Young, president; Donald A. Callahan, Louis S. Cates, and James D. Francis, vice-presidents; Julian D. Conover, secretary.

Northwest Mining Men Unite in Declaration

At the annual meeting of the Northwest Mining Association held in Spokane, Wash., on Dec. 3 and 4, men representing the mining industry of Washington, Oregon, Montana, and Idaho adopted a declaration of policy which included demands for federal control over surplus stocks of metals, for a revision and limitation of federal power to tax companies and individuals, for retention of the present system of fixing freight rates, and for the maintenance in this country of a system of free enterprise.

The Association holds that these actions, and others, are necessary and desirable because the mining industry of the United States has, in backing the war effort, seriously depleted its reserves, but has had no opportunity to develop new ore reserves to support its future operations. Governmental action is therefore believed necessary to help the industry weather the difficult postwar period of readjustment.

In addition to the policies outlined above, the Association recommends that the industry be permitted to set aside funds for development, and that time-honored policies of location and appropriation of mineral lands be adhered to. The group also suggested that social security taxes be frozen at present rates, and that financial aid be given gold mines closed by WPB order.

Extend Application Of 48-Hour Week

The 48-hour week will be in effect by the end of the year in a majority of the 193 labor shortage areas in the nation, it was announced on Dec. 9 by Paul V. McNutt, chairman of the War Manpower Commission. Among these areas, it was explained, are 69 in which acute shortages have developed. These are classified as Group 1. The remainder, Group 2, are those in which it is anticipated shortages will develop within six months.

Mandatory application of the 48-hour week in Group 1 areas was recently provided for in a War Manpower Commission instruction to field offices. Reports received from regional directors indicate that by the end of the year a large proportion of the 124 areas in Group 2 will also be on the 48-hour week. Nineteen of the Group 2 areas were on the 48-hour list when the instructions were issued in October. To these have been added 20 in which the longer week is in effect, and regional reports make it seem likely that almost all will be working the longer week by Jan. 1.

"The principal effect of the application of the 48-hour week in labor shortage areas," Mr. McNutt said, "has been the decreasing of the labor demand. It has not resulted in the release of any considerable number of workers, but it has cut down the demand for new labor and replacements."

Yearly Average Prices—1940-1943

(E. & M. J. Averages)

	1940	1941	1942	1943
Copper, domestic, f.o.b. refinery	11.296	11.797	11.775	11.775
Copper, export, f.o.b. refinery	10.770	10.901	11.684	11.700
Lead, common, New York	5.179	5.793	6.481	6.500
Lead, common, St. Louis	5.029	5.643	6.331	6.350
Zinc, Prime Western, St. Louis	6.335	7.474	8.250	8.250
Tin, Straits, New York	49.827	52.018	52.000	52.000
Silver, foreign, New York	34.773	34.783	38.333	44.750
Quicksilver (per flask 76-lb.)	$176.865	$185.023	$196.346	$195.208
Antimony, domestic, New York	14.000	14.000	15.559	15.928
Platinum, refined	$37.924	$36.000	$36.000	$35.083
Cadmium (producers' quotation)	79.920	88.443	90.000	90.000
Aluminum, ingot, 99 plus percent	18.691	16.500	15.000	15.000

Copper, lead, zinc, tin, antimony, cadmium, and aluminum in cents per pound. Silver and platinum in Troy ounces.

Exploding in a glare visible 100 miles away, 850 tons of magnesium metal, largely in the form of finished incendiary bomb casings, went up in smoke Dec. 15 at the Dallas, Texas, plant of Austin Bridge Co. Officials discounted sabotage as a possible origin for the blaze, in which damage was estimated at $500,000 but in which no one was injured. Production will be resumed shortly

Oregon Chrome Mining Stopped by WPB Order

Mining and processing of chromite in the beach sand areas of Coos County in Oregon was halted early in December by cancellation of Metals Reserve Co. contracts with companies operating there. This action was taken by Metals Reserve on the recommendation of the WPB, whose purpose was to divert men and materials to other phases of the war effort now considered more essential.

With the customary 30 days' notice, MRC cancelled its contract with Humphreys Gold Corp. on Nov. 16, and the company completed its deliveries to the government-owned finishing plant on Dec. 7. The Humphreys plant was notable for its use of spiral launder concentrators, a method of gravity concentration which had proved extremely advantageous in this installation. The plant was described in *E.&M.J.* for October, 1943.

Krome Corp., the other large operation in the district, suffered a similar cancellation of contract, and wound up its activities on Nov. 30. The company had recently increased its capacity from 2,000 to 2,500 tons daily by installing Humphreys spirals. The operation was described in *E.&M.J.* for September, 1943.

The concentrates of both these plants were treated in a nearby mill owned by Defense Plant Corp. and operated by Southwestern Engineering Co. This plant had been designed to use magnetic separation in raising the grade of the chrome product from 25 percent Cr_2O_3 to over 40 percent. In accordance with the WPB order, it was reported shut down on Dec. 30 to be held in a standby condition.

Iron Ore Quota Cut As Lake Season Ends

With the last cargo of iron ore on its way to the Lower Lake Erie docks by Dec. 8, the Office of Defense Transportation reported that the 1943 Great Lakes shipping season was successful. Shortly before the season ended, the WPB had cut the required quota for ore shipments in order to permit shipment of grain in the last few days of the season. The WPB had been asking for 86,500,000 tons as the 1943 quota, but 84,400,000 actually was shipped.

ODT officials were especially pleased with the tonnage transported this season in view of the late opening of navigation and the adverse weather prevailing through the summer. They said that 84,400,000 tons would see the steel plants through the winter and leave a 50-day stockpile on April 1, 1944. Because navigation on the Upper Lakes normally opens by April 20, ore will again be moving south before the stockpile is exhausted.

Lake carriers had moved 168,884,000 bushels of grain up to Dec. 1, and a number of ships continued carrying grain after ore shipments had ceased. It was expected that an additional 16,000,000 bushels would be carried before the last Lake boat tied up for the winter. Only 111,000,000 bushels were carried by steamer last year.

ODT reports also showed that the Lake fleet had carried 45,387,000 tons of bituminous coal during the 1943 season, and considerably more coal would have been carried if more had been available for shipment.

Postwar Place Seen For Synthetic Rubber

Speaking at the banquet held in New York on Dec. 8, at which the Chemical Engineering Achievement Award for 1943 was presented to the American Synthetic Rubber Industry, Col. Bradley Dewey, WPB Rubber Director, said that it might be possible for at least a part of the synthetic rubber industry of the United States to continue to operate in competitive postwar markets.

Postwar demand for rubber, said Colonel Dewey, could be expected to be so large that supplies of natural rubber would be inadequate, and prices of this commodity would then skyrocket. In that event, he said, the availability of ample supplies of synthetic rubber would act as a brake on prices of natural rubber.

In the six years before 1941, crude natural rubber sold, f.o.b. New York, at prices ranging between 10c. and 25c. per pound. According to Colonel Dewey, Buna S, one of the more widely used synthetic rubbers, could be manufactured for 12c., excluding depreciation. "Come what may," Colonel Dewey added, "the synthetic rubber program which you now honor has already served notice that a price of 16c. per pound for crude rubber in the United States will mean plenty of competition from synthetics."

Leadville Geology Now in Spotlight

As the driving of the 17,300-ft. drainage tunnel in the Leadville district in Colorado will undoubtedly create new interest in the geology of the region, readers may be interested to know that copies of U. S. G. S. Professional Paper 148, entitled "Geology and Ore Deposits of the Leadville Mining District," may still be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at the price of $2.50. This paper, published in 1927, was based on such a great mass of exact information that it is still essentially up to date. Because of its comprehensive character, a large edition was printed at that time with the idea that it would serve the mining industry for a long time to come. The wisdom of the plan is borne out by existing conditions, when renewed activity at Leadville is sure to call for sound geologic information on the district, especially those parts that will be materially affected by the drainage project.

PERSONAL NEWS

George L. Craig has been appointed director of research of Calumet & Hecla Consolidated Copper Co. He is a metallurgist and research engineer, joined the Calumet & Hecla organization in 1934, and prior to that was engaged in research work with the Battelle Memorial Institute. He will make his headquarters in Calumet, Mich.

J. Barab, formerly with the Hercules Powder Co. for 21 years, and for the past 2½ years chief chemist for Todd & Brown, Inc., operators of the Kingsbury Ordnance plant, recently resigned from the latter position to engage in consulting practice as a chemical engineer specializing in the field of explosives. His new address is 299 Madison Ave., New York 17, N. Y.

Charles A. Neal, of Miami, Okla., was elected president of the Tri-State Zinc & Lead Ore Producers Association at an annual business meeting held Dec. 8 in the association offices at Picher, Okla. Neal, a prominent Miami business man and civic leader, has been engaged in Tri-State mining and milling enterprises for many years, and is well known among district mine operators and those associated with the zinc industry.

Robert L. Dean, formerly general superintendent of the Combined Metals Reduction Co. mine at Pioche, Nev., has been promoted to executive assistant to **E. H. Snyder,** general manager with headquarters in Salt Lake City, Utah. **L. G. Thomas** has been appointed general superintendent at Pioche, and **Sam Arentz,** mining engineer and geologist, has been promoted to mine superintendent.

Edward H. Rott, who has been in the Mining Division of the War Production Board for the past two years, has been placed in charge of all field offices and personnel for mining throughout the Western region, with the title of Assistant Deputy Director for Mine Production. His office is at 510 Continental Oil Bldg., Denver, Colo.

Stanly A. Easton, president of Bunker Hill & Sullivan Mining & Concentrating Co., was honor guest at a banquet at the close of the Northwest Mining Association convention in Spokane recently. The occasion commemorated Mr. Easton's 40 years of active participation in operations at Bunker Hill.

H. K. Sherry and **George K. Foster,** vice president and general manager and superintendent of mine development, respectively, of Canadian Johns-Manville Co., Ltd., recently returned to their headquarters at Asbestos, Que., following completion of business with company officials in New York City.

William A. O'Neill, general superintendent of all McRae-Patty mining operations in northern British Columbia, Yukon, and Alaska, left for Seattle following the close of dredging by Clear Creek Placers, Ltd. It is his intention to seek admission into the United States Navy.

Merle H. Guise has returned to the United States from Alaska, and can be reached at 1507, East 64th St., Chicago, 37, Ill.

Fernando Murillo Le-Fort has been elected secretary of the Associacion Minera de Antofagasta, Chile, succeeding Carlos Silva Mendez, deceased.

Dr. C. G. Flebus is in charge of the Bureau of Mines' sponge iron program in the Western region, with headquarters at the sponge iron pilot plant at Laramie, Wyo.

Gomer P. Jones, for 30 years manager of the Hedley Gold Mining Co., has been honored with a life membership in the Canadian Institute of Mining and Metallurgy.

Mannie Olson and **Mrs. Olson** are in Seattle for the season. He is a pioneer mining man of many Alaska camps. He has turned over all the equipment in his Wolf Creek Mining Co. to the government.

James M. Eakins, of Noranda, Que., who was appointed by the National Selective Service to make a survey of the mine-labor situation, is investigating labor conditions in British Columbia gold mines.

Louis S. Cates, an alumnus of Massachusetts Institute of Technology (class of 1902) and president of Phelps Dodge Corp., has been elected a life member of the M.I.T. Corp.

Reuce E. Warriner, having fulfilled an assignment with the U. S. Army Ordnance Department, has returned to his post with International Nickel, at the company's New York Headquarters at 67 Wall St.

J. A. H. Paterson, who for the last two years has been on the staff of the Metals Controller's office at Ottawa, Canada, has been made general manager of the Mining Corp. of Canada, effective Jan. 1.

Dale L. Pitt, president of Colonial Mica Corp., mica purchasing agent for Metals Reserve Co., announces that the corporation has removed its offices from 92 Liberty St. to 141 Broadway, New York.

Ronald McKay, geologist, who has been prospecting in northern British Columbia and southern Yukon on behalf of Conwest Exploration Co., Ltd., during the past season, has returned to Vancouver.

Padraic Partridge has joined the operating staff of the Union Mines Development Co. in Colorado, a new unit of the Union Carbide & Carbon Corp. He was formerly assistant geologist for the International Smelting & Refining Co. at Yerington, Nev.

Lowell A. Griffith has been elected vice president of the Gilpin County Metal Miners Association; **W. E. Scott, Jr.,** is president of the Association. Griffith takes the place of **Roy Waugh,** and **Clifford I. Parsons** was elected secretary-treasurer, replacing **L. L. Nothenson.**

Allan M. Short has resigned as mineral technologist with the Bureau of Mines, Salt Lake City station, to serve in a similar capacity for the Missouri Pacific Lines, with headquarters in St. Louis. He succeeds the late W. M. Wiegel.

Mr. and Mrs. Burnett (Barney) Hansen have returned to Eagle, in the Seventy-Mile Creek district of Alaska, where he has placer property. He formerly was foreman for the U. S. Smelting Co. on Cripple Creek and Mrs. Hansen was a teacher.

Mustapha Teoman, formerly secretary-general of Eti Bank, which is the Turkish mining trust, with headquarters in Ankara, is now making his home in Smyrna, on the Aegean, where he is manager of a manufacturing plant. Mr. Teoman spent six months or more in New York in 1939 as representative of Eti Bank. During this time he arranged and supervised his government's mining exhibit at the New York World's Fair.

M. Teoman, former Secretary-General of Eti Bank, at Ankara, which functions as Turkey's State mining trust, now lives in Smyrna, where this picture was recently made. Mr. Teoman is in the center.

D. D. Moffat, president and general manager of Utah Copper Co. was elected president of the Utah Metal Mine Operators Association at the annual election in December. **A. G. Mackenzie** was reelected manager. Mr. Moffat succeeds **F. S. Mulock,** vice president and general manager of Western operations, United States Smelting, Refining & Mining Co. Other officers elected were: **Frank A. Wardlaw, Jr.,** first vice president; **E. H. Snyder,** second vice president; **James W. Wade,** third vice president.

Hugh R. Van Wagenen, mining engineer, formerly practicing his profession in Los Angeles, after eight months in Australia as mining engineer for the Board of Economic Warfare has gone to Africa for the same organization, now known as the Foreign Economic Administration. He will make his headquarters at Johannesburg, his address being care of the American Consul. His professional activities will take him to several parts of the Union of South Africa, and also to Mozambique, Nyasaland, Tanganyika, and the Rhodesias.

W. E. Dewald, superintendent of the M. A. Hanna Co. Hiawatha group of mines at Iron River, Mich., has been transferred to Iron Mountain, Mo., in charge of operations there. **R. B. Wortley,** superintendent of Wakefield mine, at Wakefield, Mich., moves to Iron River as superintendent of the Hiawatha group of mines, and **F. E. Keese,** superintendent of both the Bates and Zimmerman mines, will divide his time between the Bates and Wakefield mines, as the Zimmerman closed down on Sept. 15, 1943, for good.

James O. Elton, manager of International Smelting & Refining Co., retired Dec. 31. He will be succeeded by **Frank A. Wardlaw, Jr.,** who has been assistant manager. Mr. Elton was appointed in 1921 to rehabilitate International Company's smelting interests at Tooele, Utah, a task which he accomplished with brilliant success. He began his mining career in the Coeur d'Alene district of Idaho. For 35 years, he has been employed by Anaconda Copper Mining Co., and its subsidiary, the International.

C. C. Morfit & Associates, of New York City, have been engaged by the Peruvian government to study and report on the iron and coal industries of Peru. The Morfit organization has investigated and reported on, and designed and supervised operation of similar projects in North and South America, England, France, and China. The work in Peru is already under way and that country has initiated shipments of the natural resources mentioned. Chimbote, a Peruvian port on a fine harbor, is expected to become an important steel and iron center. Up-to-date piers and handling facilities have been under construction for more than a year by the Frederick H. Snare Corp., of New York. These developments are expected to make Peru more self-sufficient and to enable her to import manufactured goods and thus to raise the general standard of living of the country.

Obituaries

Edwin Clark Monroe, active in mining in Arizona for a number of years, passed away at his home in Phoenix on Dec. 5.

Ben Allen Evans, 63, a mining engineer well known in Nevada and California, died in Quincy, Calif., on Dec. 11.

Fred Rooney, mine foreman at the Shattuck Denn from 1917 to 1937, died early in December in Shelton, Wash.

B. A. Ogden, former co-owner and manager of the Densmore mine, at Columbia, Calif., died recently in Oakland, Calif., at the age of 83.

Walter J. Fancher, active for many years in the operation of mines and mills at Manhattan, Nev., died Dec. 15 at Glendale, Calif.

Frank Blodgett, retired mining engineer formerly with Anaconda Copper Mining Co., Butte, Mont., died in Los Angeles, Calif., on Nov. 21, 1943, aged 79.

Clyde McKeever Laizure, mining engineer associated with the San Francisco office of the California State Division of Mines for 25 years, died on Dec. 21.

Victor G. Grand, a prominent mining man of the Klondike, died recently at Dawson, following several weeks of suffering after an accident at Keno Hill in the Mayo district.

E. W. Parker, long prominent in the anthracite industry and managing editor of *Engineering & Mining Journal* from 1901 to 1902, died in Philadelphia, Jan. 3, aged 83 years.

Victor F. Larsen, sales engineer for the crusher division of Nordberg Manufacturing Co., and well known in the Iron Range country, died on Dec. 17 as the result of an auto accident.

Albert Emerson Vandercook, general manager of Central Comstock Mines, Inc., Virginia, Nev., and inventor of the aërated mercury cyanide direct decantation gold-recovery process, died in Sacramento, Cal., in November, 1943, at the age of 69.

Dr. Walter S. Morley, 68, associate professor emeritus of metallurgy, University of California, Berkeley, Calif., and his wife, **Mrs. Mabelle Morley,** died recently of injuries received in an automobile accident.

Sydney E. Wilson, aged 30, graduate mining engineer of the class of '39 of the University of British Columbia, died on Dec. 4 last from pneumonia contracted during a lay-off caused by a minor injury in the Bralorne mine.

George Otis Smith, distinguished geologist, Director of the U. S. Geological Survey for 23 years, who spent 40 years in the service of the Federal government and who was chairman of the Federal Power Commission in President Hoover's Administration, died at Augusta, Me., on Jan. 10 at the age of 72.

Prof. Joseph F. Oesterle, of the department of mining and metallurgy of the University of Wisconsin, died on Dec. 7 at the age of 55. In 1913 he received the degree of B.S. from the University and in 1929 the degree of Ph.D. in metallurgy. He had long been active in professional and civic affairs and was a member of several professional associations as well as of the A.I.M.E.

O. C. Davidson, who on his retirement in April 1931 had been general superintendent for Oliver Iron Mining Co. on the Geogebic and Menominee ranges for 12 years, and who had been identified with Iron Country mining since 1882, died at Iron Mountain, Mich., on Dec. 5 at the age of 86. In addition to his mining interests Mr. Davidson was active in the promotion of electric and power industries of northern Michigan.

M. C. (Sell) Tarr, a resident of the Mammoth district of Arizona for 35 years and well known in mining circles, died at Mammoth in late November, 1943, at the age of 70. He was born in Idaho Springs, Colo., and began working in the mines at the age of twelve. He gained his first mining-boom experience in Cripple Creek. Going to Arizona during the Bisbee boom he remained there through that period then moved to Globe in time to participate in the boom there. Mr. Tarr worked on his claims in the Tarr Wash by hand as he learned to mine as a boy. So far as is known he held the world's record for single-jack drilling, having taken the championship at Bisbee in 1904 by drilling 38½ inches in fifteen minutes. With his brother, **Henry Tarr,** he held the world's championship for double-jack drilling.

Letters

Little Federal Control of Mineral Deposits on Public Lands

The Editor:

THE Alaska Miners Association, which includes among its members practically all of the mine operators in the Territory, is strongly opposed for many reasons to any proposal to extend the Leasing Act of 1920 to metal mining. Our reasons are that we think the application of such an Act to metal mining is impractical, that it is not needed, and that such a drastic change and the abandonment of our long-established mining laws would cause much unnecessary confusion and an inevitable slowing down in the essential work of discovery, opening up and operating mines, without any compensating benefits to anyone.

Our contention that the application of the Act to metal mining is impractical refers particularly to the requiring of prospecting permits and the close supervision and regulation of operating mines by the Bureau of Mines or other Federal agency.

A prospecting permit, if required, would presumably specify a creek or other small area within which the permittee might prospect, would give him the exclusive right to prospect on it, and certain preferential rights thereafter. Unless it did so

it would be useless. In Alaska the distances are great, transportation is often slow and difficult to obtain, recording offices and other government offices are few and far between, most of the land is not subdivided or mapped, and many creeks and even rivers have no names. Under such conditions the time and red tape required to get a permit would be prohibitive and would effectively discourage most prospectors. This applies to both placer and lode prospecting.

If the metal mines were placed under the Bureau of Mines as the coal mines now are, and subjected to the same sort of regulation, the operator would presumably be told what oreshoots, or stopes, or pay channels he could or could not work, the sequence in which they could be worked, and the mining and metallurgical treatment he must use. A lead miner might be told that he could not mine his lead unless he recovered all copper, zinc, and cadmium in it. We believe that because of the great diversity of conditions and the variety of deposits any attempt by a department in Washington or a regional office in some central city to regulate such matters, no matter how intelligently handled, would be doomed to failure and during the period of its operation would completely tie up mine development and operations.

The reason for all of this, according to the proponents of the plan, is that it is needed to prevent waste of natural resources and protect the safety and welfare of workmen. We contend that it is not needed for either purpose because metalliferous deposits, unlike coal and oil, ordinarily occur in isolated beds or veins which do not have to be mined in any particular sequence or manner to avoid waste.

As for promoting the safety and welfare of the workmen, it may be pointed out that this problem is not one peculiar to the natural-resources industries and that it is now being satisfactorily handled by State and Territorial safety laws, which have the advantage that they can be readily changed to suit local requirements as special conditions arise.

The adjustment of the rate of production to marketing needs is necessary in times of emergency, but in normal times we believe it can be more effectively accomplished by the natural working of the law of supply and demand, and that when that law is allowed to operate the response of production to increased needs is more prompt than it can be with any government regulation. The efforts we have seen in recent years to accomplish this by government edict or other artificial means certainly have not encouraged us to think otherwise.

As for the "maintenance of reserves of essential minerals," we are unable to understand how the application of the Leasing Act to the metal-mining industry would help. There are few metallic deposits in the public domain which can be definitely classed as minable at a profit under normal conditions and prices. If reserves are to be set aside, therefore, they must either be deposits which are privately owned and have been blocked out by private capital, or they will have to be found and developed by the government to the point where their content is definitely known. Unlike coal, oil, phosphate, and other bedded types of deposits, the presence of which can be inferred from the geological conditions, the setting aside of undeveloped land which is merely suspected of containing metallic mineral deposits accomplishes nothing if the mineral still has to be discovered before it can be used.

For these reasons and many others, we are strongly of the opinion that the application of the General Leasing Act of 1920 or any other similar leasing act to the metal mining industry would be impractical or inimical not only to the best interest of the industry, but to the country as a whole.

ALASKA MINERS ASSOCIATION
Al Anderson, Secretary.

Fairbanks, Alaska.

Free Enterprise—A Congressman Seeks a Definition

The Editor:

WELL, from the old reactionary McGraw-Hill Company with its line of publications catering to all the trades—and particularly the mining industry with its demonstrated opposition to a sound monetary system by the use of silver and silver money—it is certainly interesting to receive the pronouncement in favor of "Free Enterprise" embodied in an edipictorial advertising broadside which has just been laid on the Congressional desks!

Free Enterprise—and the policies of the McGraw-Hill Company—when did they coalesce?

Free Enterprise—What is it? Is it the policies of the big mining companies in the way they assist and foster the interest of the prospector and help new mining companies?

Free Enterprise—Is it the policies of the mine machinery manufacturing companies that advertise in *E.&M.J.*—big companies that have continually raised the price of mining equipment; and is free enterprise helped by their practices in dealing with new mining machinery manufacturers that might operate to check this price increase trend?

Free Enterprise—Is it the policies of the big oil companies in dealing with small oil producers?

Free Enterprise—Is it the policy of the power companies in dealing with local utilities and the electric energy consumers?

Free Enterprise—Is it the policy of the big paint companies in fixing paint prices and shoving worthless substitutes, and in their dealing with new paint manufacturing concerns seeking to make and market a good and durable paint?

Free Enterprise—Is it the policy of the glass trust in their treatment of their competitors, and in fixing the price of windowglass?

Free Enterprise—Is it the policy of the farm machinery trust in dealing with enterprising new manufacturers seeking to supply some line of farm machinery needs at a fair charge?

Let's have a definition of "Free Enterprise," and what the shibboleth means, before we rush back headlong into the arms of the big business aggregation of this country that upset and unbalanced our national economy, and gave us the price structure and business conditions that are chiefly responsible for plunging this country sixty-three billions of dollars in debt—before we undertook to finance a Global War!

Free Enterprise—and the fostering of competition that will operate to bring into play the law of supply and demand to equitably adjust prices is a grand thing—if that is what is really meant!

COMPTON I. WHITE
Member of Congress, Idaho

Washington, D. C.

EDITOR'S NOTE. We are pleased to present Mr. White's views, which he submitted "for publication in my old friend, the *Engineering and Mining Journal*." After covering considerable territory with a series of rhetorical questions, he finally offers a definition, the basis of which is fostering competition. Unquestionably that is one of the elements of free enterprise. A more complete discussion of this subject appeared in *E. & M. J.* for November, 1943, in which a stand was taken in favor of competition and against protection or privilege for special interests. A copy of the complete editorial is being sent to Mr. White.

Diamond Drilling For the Raft Lake Cuts

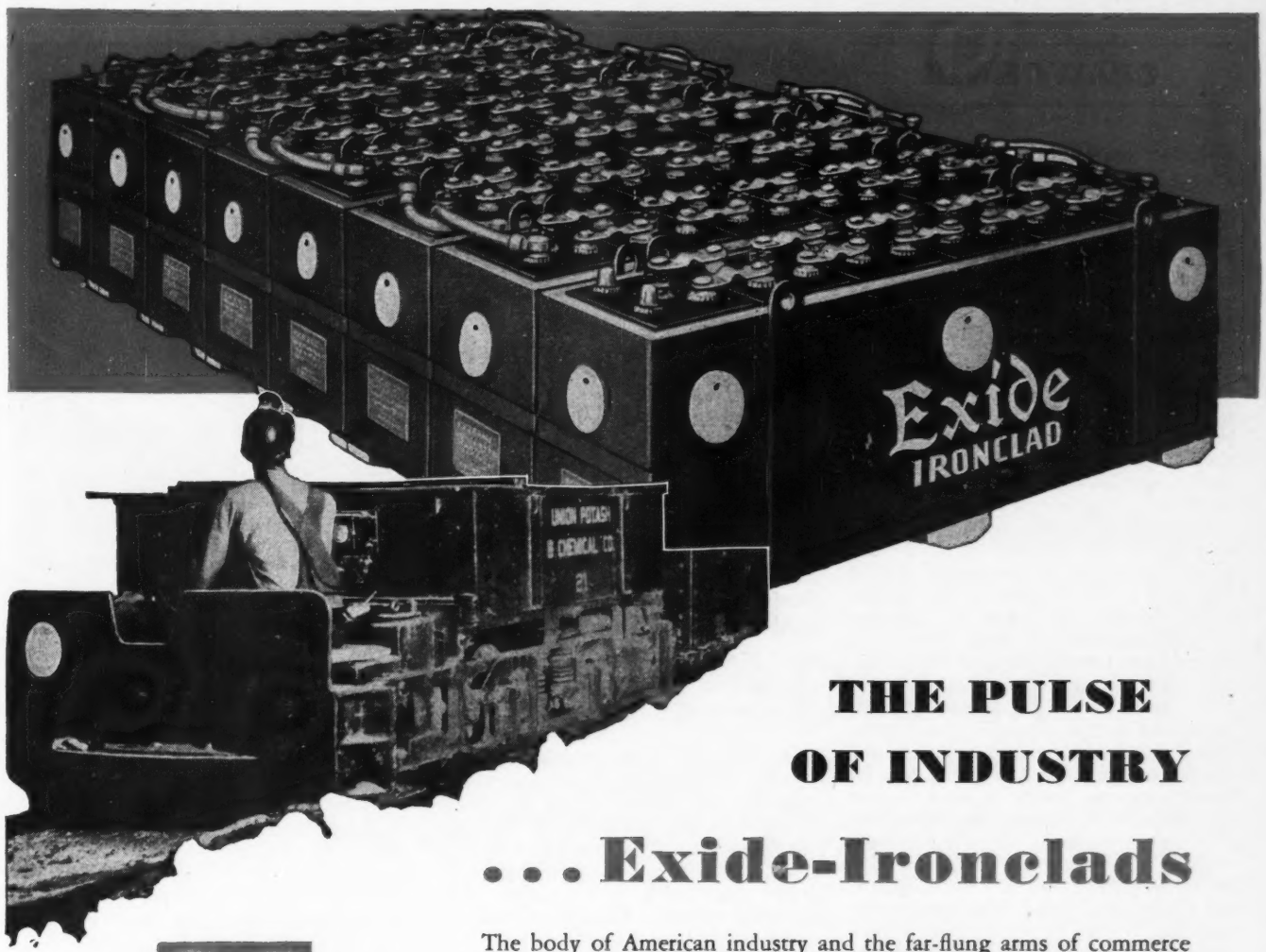
The Editor:

YOUR comprehensive article on the progress made on the Steep Rock enterprise, in the December issue, is very clear and informative. The paragraph on page 90 commencing "The excavation of the Raft Lake cuts, etc.," however, gives the reader the impression that Patrick Harrison planned the diamond-drill cut and drilled the long, horizontal holes underground.

The method of drilling and blasting was introduced and executed by Boyles Bros. Drilling Co., Ltd., acting as subcontractors for the general contractor, C. A. Pitts. Harrison was engaged to put in the 7x7-ft. tunnel from which we drilled our horizontal diamond-drill holes to cut the floor of the cut. He had nothing else to do with that cut. Both his organization and C. A. Pitts did preparatory work so that we could drill. Pitts stripped the surface of overburden and Harrison drove the tunnel. These two jobs were about equal in expense and importance.

C. H. HOPPER
Consulting Engineer
Boyles Brothers Drilling
(Eastern), Limited

Kirkland Lake, Ont.



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. . . Exide-Ironclads

The body of American industry and the far-flung arms of commerce and trade are controlled by the pulse beat of American mines. You can almost measure the tempo of production by the steady beat . . . the pulsating . . . the rumbling of speeding underground electric locomotives, shuttlecars and trammers. Therein lies the potential power of industry.

Hand-in-hand with this is the power of Exide-Ironclad Batteries. More Exides are used underground than all other batteries combined. The simple reason is that the power reserve of an Exide-Ironclad is abundant for every demand. Add to that, faithful, uninterrupted service, extreme ruggedness, and long life and you can readily see why Exide is the leader. A plus factor is the ease of maintenance which saves labor, and costs as well. When you buy an Exide you *Buy to Last*. Take care of them and *Save to Win*.

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia 32
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MAINTENANCE IS EASY IF YOU FOLLOW THESE RULES:

1 Keep adding approved water at regular intervals. Most local water is safe. Ask us if yours is safe.

2 Keep the top of the battery and battery container clean and dry at all times. This will assure maximum protection of the inner parts.

3 Keep the battery fully charged—but avoid excessive over-charge. A storage battery will last longer when charged at its proper voltage.

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If you wish more detailed information, or have a special battery maintenance problem, don't hesitate to write to Exide. We want you to get the long-life built into every Exide Battery. Ask for booklet Form 1982.

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BATTERIES

CALIFORNIA

Copper production increasing in Calaveras County — Bradleys to reopen Bullion mine

▶ Production of copper is steadily increasing at several mines active in the copper-zinc belt of Calaveras County, particularly in the Copperopolis-Campo Seco areas, which resumed operations after years of idleness when war demand for strategic minerals turned interest from gold to nonferrous metals. Operations have been expanded considerably at the Keystone mine, near Copperopolis, since acquisition by Lava Cap Gold Mining Corp., Otto E. Schiffner, vice president and general manager, several months ago, with output expected to be doubled within a year. About 140 men are employed. Pacific Mining Co., P. R. Bradley, Jr., general superintendent, has placed in operation its 1,000-ton flotation plant installed to treat a large tonnage of accumulated tailings from former copper-mining operations, and activities are soon to be conducted on a full capacity basis. Other mines active and producing include the Newton copper mine, near Ione, Amador County, operated by the Winston Copper Co., with Hal M. Lewers, superintendent, directing operations; the Penn mine, worked by Los Angeles interests headed by H. G. Miller and G. W. Clemson; the Collier, and others. Geologic studies instituted by the U. S. Geological Survey in 1942 to aid in the finding of new mineral deposits and in the development of ore occurrences already known in Calaveras County are being continued.

▶ Carroll Winrod and associates are reported to be developing a promising chrome deposit in the St. Charles district near Dowieville, Sierra County.

▶ Dredging operations are scheduled to be resumed soon by Rand Gold Dredging Associates. Its bucket-line dredge capsized some months ago and is now being righted by Yuba Manufacturing Co., of San Francisco. The dredge is designed for the recovery of both gold and scheelite and works placer ground near Randsburg, Kern County. The property is managed by Newton Cleaveland, San Francisco placer mining engineer.

▶ Bradley Mining Co., Worthen Bradley, president, has started rehabilitation and exploration work at the Bullion quicksilver mine, in Lake County, following completion of a 15-year lease agreement with the Otto family, of Albany and Middletown. The Bullion property is about 4 miles southwest of Middletown, between the Mirabel and Great Western quicksilver mines, and was formerly worked by the Standard Quicksilver Co., together with the Mirabel and Great Eastern, until 1903. Since then the mine has been worked intermittently and a small production of quicksilver was made in 1917.

▶ Dewatering of the Buzzard mine, in northwestern El Dorado County, is progressing satisfactorily. The property is operated under lease by Paul F. Taylor, who has recently installed hoisting equipment and plans early erection of a flotation plant to treat dump material containing good gold, silver, copper, lead, and zinc values. Ore is available at several points underground.

▶ The Rough Diamond Crystal mine, near Mokelumne Hill, Calaveras County, is producing steadily, with a weekly output of quartz crystals reported at about 150 lb. Some large crystals have been taken out recently, including two weighing 200 lb. and 112 lb. each. The mine is operated by E. C. Setzer and L. Brinkman, with S. Menchini in charge of operations.

Surface plant of Highland-Surprise mine, on Pine Creek, in the Coeur d'Alene district of Idaho. This 150-ton mill began operating last summer and ships zinc concentrates to the Sullivan smelter, although production was interrupted last year by a shortage of equipment

ARIZONA

American Zinc options Irene mine —Eagle-Picher's Tucson mill to refuse custom ores

▶ The Williams tungsten mine, owned by Roy Williams, E. E. Bollinger, and associates of Kingman, has been leased for a long term to W. S. Bradbury, of Kingman, who has been granted an R.F.C. loan of $20,000. Some years ago the Continental Mining Corp. of New York, built a 50-ton gravity concentration plant on the property. This plant will be reconditioned and the 12,000 tons of ore reported to be blocked in the mine will be handled through the plant.

▶ R. B. Strassburger, mine operator and owner of the Norristown, Pa., *Times-Herald*, has taken over the Antler mine, near Yucca, which has been operated by the Vukoye brothers, of Kingman. Operating under R.F.C. loans, Vukoye brothers have developed a large body of copper-zinc ore during the past year. The ore will be shipped to the U. S. Smelting, Refining & Mining Co. plant at Midvale, Utah.

▶ Shipments to Salt Lake City of lead-zinc silver-gold ores from the Manzanita mine, in the Chloride district of Mohave County, are continuing. The property is owned by Minnesota-Connor Mines, Inc., T. M. Recchiutti, Camden, N. J., president, and R. E. Lord, Chloride, vice-president and general manager.

▶ American Zinc, Lead & Smelting Co., of Spokane, Wash., has taken a long-term option on the Irene mine, north of Globe. D. I. Hayes, of Spokane, Wash., is in charge of operations. Ernest Horley, engineer for the company, is in charge of diamond-drilling explorations. The property is owned by Liberty Mining Co., Anton Trojanovich, Globe.

▶ The Black Pearl mine, in the Camp Wood district of Yavapai County, has been reopened by Fred Gibbs of Prescott. A new road has been completed to the portal of the tunnel and a milling plant is contemplated.

▶ Shipments of fluorspar are being made from the Lucky Nos. 1 and 2 properties, 15 miles north of Duncan, by Don McCabe and E. F. Sanders, lessees. The property is owned by Sanders and Gene Luckie, of Lordsburg, N. M. The metallurgical grade spar is sold to Indian Metals Co. at Lordsburg and the rest of the output is shipped to Eastern buyers.

▶ Silver Strike mine, at Hilltop in Graham County, has been leased by the owner, Ralph Morrow, to his brother, John A. Morrow. The property contains values in lead, zinc, copper, silver, and molybdenum.

JANUARY...A TIME TO LOOK *Both Ways*

JANUARY, named for the Roman god Janus, is traditionally a time to sum up the accomplishments of the past year and to look forward to the year ahead.

This year particularly, wise management in the Iron and Steel Industry is making use of the experience gained in the past few years to plan *now* for the reconversion to peacetime operation.

The extensive participation of the McKee organization in the program which provided facilities for the miracle of production accomplished by the industry has given us an additional fund of up-to-date experience which can be invaluable to you in preparing for the peacetime conditions which come nearer every day.

The foresight of McKee engineers is no magic ability to see into the future—it is sound, practical engineering based on many years of experience in ore preparation and sintering plant engineering in all quarters of the globe.

The capacity, scope and flexibility of the McKee organization enable us to serve you to any required extent and on the basis best suited to your particular needs.

Arthur G. McKee & Company

Engineers and Contractors

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ROCKEFELLER PLAZA
NEW YORK, N. Y.

COMMERCE BUILDING
HOUSTON, TEXAS

Arizona *(continued)*

▶ Work at the Paria Copper Co., of Kanab, Utah, located near Moquitch, in Arizona, is being directed by W. W. Whiting, mine superintendent. F. A. Heaton, of Kanab, is purchasing agent.

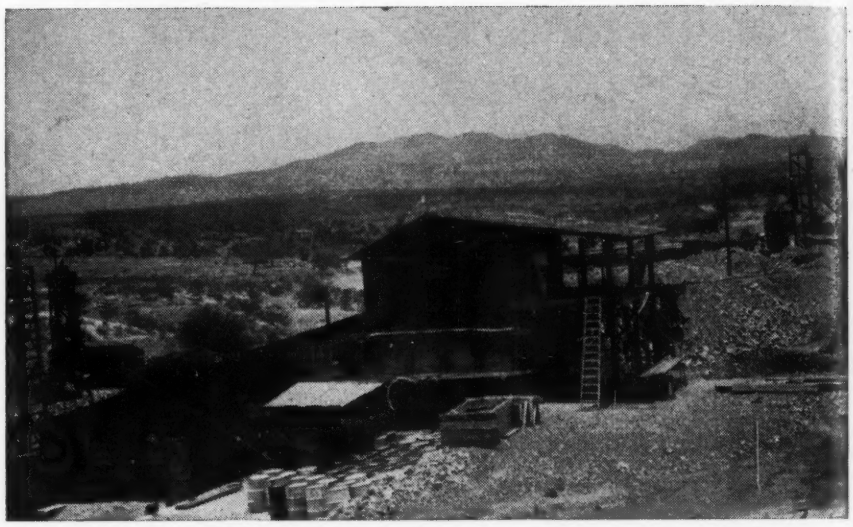
▶ Eagle-Picher Lead Co., operating the San Xavier mine, about 30 miles south of Tucson, has announced that it will not handle custom ores as originally planned. The plant consists of a 150-ton lead-zinc concentrating plant. E. H. Crabtree, formerly of the Arizona Bureau of Mines at Tucson, is superintendent of the mill.

▶ Strategic Metal Mines Co., operating the Empire mine, northeast of Parker, under a sublease from Arizona Empire Mining Co., Inc., is planning to start operations at the Whipsaw mine, east of Morristown in the Castle Hot Springs district in Yavapai County. E. R. Sandau of Parker is manager, R. L. Glassbrook, superintendent, and H. H. Tuerck, mine foreman.

▶ J. D. Merrill, operating for a partnership on the Horseshoe mine, in the Lone Star district of Graham County, reports that the access road to the property has been completed. The ore carries about 3 percent copper, and shipments will be begun immediately. About 700 tons of ore have been shipped from this property to the International smelter at Miami.

▶ Erven Brewer, Santa Cruz, Calif., owner of the Moore group of 46 patented claims in the Plomosa district in Yuma County, has leased the property to E. M. Marshall of Vicksburg. Marshall expects to start shipping copper-silver ore soon.

▶ Shipments of fluorspar ore from Daniels Camp, 16 miles north of Duncan, to Indian Metals Co., of Lordsburg, N. M., are being made by Robert T. Ellis, of Duncan. The present rate of production is 15 tons daily, which will be increased on completion of stripping operations.



Mine and 60-ton flotation mill of Cia. Minera Mercurio en Sain Alto, S. A., Sain Alto, Zacatecas, Mexico. Using modern equipment throughout, this mill began operation last year and is one of Mexico's most important producers of mercury

NEVADA

Molybdenite found in Pershing County — Jean smelter plans dropped—Dividend at Tonopah

▶ Suit has been filed by Consolidated Coppermines Corp. against White Pine County to recover $10,237.54 in excess bullion tax, paid under protest by the company. A dividend of 10c. per share was paid on Dec. 15. In the nine months ended Sept. 30, net receipts were $700,873, against $1,142,069 in the 1942 period. Net income before depletion was $192,270, compared with $471,058 in the 1942 nine months, with net of $72,961 for the third quarter this year, less than one-half the profit in last year's quarter. Manpower shortage, higher operating costs, and increased federal income taxes accounted for the drop in earnings.

▶ Molybdenite has been found over a wide area in drilling below shallow horizons of old workings on the Fifty-Six copper mine, 6 miles west of Imlay, Pershing County, near the new Majuba Hill road. The mine, under development by Harvey S. Mudd and associates in Los Angeles, was located in 1856 and is said to have been the first mine location recorded in the area that was then Nevada Territory. Shipping ore has been mined at long intervals, containing silver and gold in addition to copper. The claims were owned in the nineties by the Wyoming-Nevada Copper Co. and in late years by the late Frank Reber.

▶ Two Bureau of Mine crews are engaged in deep drilling on formerly productive lead-zinc-silver properties of the Richmond Eureka Mining Co. on Ruby Hill, near Eureka, with provision for drilling several holes to a depth of 2,300 ft. or more and with two holes already well advanced. Lead-zinc ore was found at this depth in earlier drilling by E. J. Longyear Co. for the Eureka Corporation, Ltd., subsidiary of Ventures, Ltd., of Toronto, with long-term lease on the mines, which are credited with early production of over $65,000,000. William Sharp, mining engineer, is manager at Eureka for the lessee and E. O. Binyon is in charge of drilling.

▶ WPB has withdrawn its approval of plans to construct a zinc plant at Jean, on the Union Pacific railroad in Clark County, to treat carbonate zinc ore from the nearby Goodsprings district by the Waelz vaporizing process. Metals Reserve Co. will continue to purchase zinc-lead ore for delivery to its stockpile at Jean. Further accumulation, it has been indicated, has in view early construction of a major-capacity plant at Pioche, with relatively short rail haul from Jean, to treat oxidized ore of that district.

▶ A dividend of 3c. per share was paid Dec. 28 to shareholders of the Tonopah Mining Co. of Nevada, marking a 43-year period in which the silver-gold mines at Tonopah have been worked with profit. Tonopah Mining last year sold its 80 percent interest in the Tonopah & Goldfield railroad to the Dulien Steel Products, Inc. Present income is said to come chiefly from its interest in La Luz Mines, Ltd.

▶ Following adjustment of a jurisdictional dispute between labor unions, construction work is in progress at the Caselton selective-flotation mill of the Combined Metals Reduction Co. at Pioche, to increase capacity from 500 tons per day to nearly double that volume. E. H. Snyder, Stockton, Utah, is president and manager for the reorganized company.

▶ With the arrival of ore trucks operated by a Montana contractor, zinc-cadmium-lead ore is being shipped at the rate of 100 tons per day from the Mount Hope mine, 24 miles north of Eureka. The mine, leased from the Columbia Steel Corp., is operated by Leverett Davis Mining Engineers of Boise, Idaho. The operation is directed by Major Leverett Davis, who has long been manager of mines for the Callahan Zinc-Lead Co., of New York, and who was accompanied to the mine recently by Harry B. Van Sinderen, president of Callahan Zinc-Lead. The Federal Housing Administration is providing 40 temporary dwelling units and 30 family trailers at the Mount Hope mine.

▶ Several carloads of fluorspar, reputed to be of high quality, have been shipped from Cirac mine, in the Stillwater range in northern Churchill County. Jafet Lindeberg, of Alaska fame, with two associates, operates the mine under lease and trucks their product some 60 miles to the Fallon rail point.

▶ Equipment of the Marigold Mines, Inc., at its gold property 5 miles south of Valmy, Humboldt County, has been sold at sheriff's sale for $600 to a Reno accountant. The company was headed by the late Frank E. Horton, pioneer of the Gold-

EARLY DAY BUTTE

● The rejuvenation of the ghost town of Butte—placer-mining camp of early gold-rush days—began with the development of copper mining in 1882. The first copper claim staked in Butte—by Prospector Hickey—got its name from an old Civil War paper. Hickey had read the phrase, "Grant's armies are encircling Lee's forces like an Anaconda." He liked that word "Anaconda" and used it as the name for the claim he staked in '82.

During the past twenty years Bear Brand Xanthates have been in continuous and consistent use for the flotation of the sulphide ores of Butte. Efficiency in operation, plus stability and uniformity, have won a worldwide acceptance for these famous flotation reagents.

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DOW

CHEMICALS INDISPENSABLE TO INDUSTRY AND VICTORY

What's New IN SAFETY

NEWS ABOUT SAFETY EQUIPMENT AND METHODS

"Trigger Finger" Guard

A comparatively new occupational hazard that is causing absenteeism is described as "women welders' disease," or more commonly referred to as "trigger finger." It is believed to be most common among women employees because their hands are comparatively tender and smaller in size to men's hands.

Tendons become bruised and begin to swell on the hand that grasps the stinger or torch, with the result that one or more fingers become stiff and relatively useless. In the majority of cases the resulting disability runs from three weeks to three months; while in severe, neglected cases surgery may be necessary to relieve the condition.

A "Trigger Finger" Guard has been developed that is said by users to prevent this condition. The device consists of a chrome leather palm and finger guard to be worn under the welder's glove. Three soft, spongy cleats are so placed on the guard that they protect the parts of the hands that are known to be vulnerable.

Either right or left hand guards are available. Adjustable wrist strap holds the guard in the correct position, and also makes the "Trigger Finger" Guard a universal fit for all women. 1-2-44

E. D. BULLARD CO.

275 EIGHTH STREET, SAN FRANCISCO, 3, CALIF.

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EVERYTHING BULLARD IN SAFETY

Nevada *(continued)*

field district and owner of the Weepah mine, in Esmeralda County. He had started construction of a 200-ton cyanide mill and was shipping some 200 tons monthly when compelled to close down by the WPB order.

▶ A 30-ton Nichols-Herreshoff furnace, buildings, and other equipment on cinnabar property operated formerly by the McAdoo Mining Co. in the Bottle Creek district of Humboldt County have been purchased by Joseph E. Riley, of Winnemucca, who has leased the mine property, embracing 34 claims. Riley also is working the Durnin tungsten property near the Getchell mine, in the Potosi district, from which he has been delivering 200 tons of scheelite per day to a nearby NRC stockpile.

▶ The old McNamara silver-lead mine, in southwestern Esmeralda County, located in 1880 and productive thereafter when equipped with a mill, is being reopened by the newly-organized Neva Zinc-Lead Inc., headed by George G. Moore, of Monterey, Calif., and with office at Goldfield. A new road has been built to the property.

▶ Trucks lately delivered a lot of 100 flasks of mercury to the Metals Reserve depot at Winnemucca from the furnace at the Red Bird cinnabar mine of the Harold's Club Mining Co. in the Relief district, southern Pershing County. Harold Smith, of Reno, one of a family group owning the company, is directing activities here and at the Valley View scheelite property.

▶ Officers at the Tonopah bombing and gunnery range, largest in the State, have warned flying students against use as a machine-gun target of a windmill and concrete well sump near Cuprite, Esmeralda County, from which Ernest A. Moross, of Goldfield, secures his water supply for the Ralston cinnabar mine near Cuprite. A repair crew from the air base lately repaired damage to the well equipment.

▶ A new cinnabar district of promise is being opened at the base of the East range in eastern Pershing County, where Walter Low, after extensive sampling, is producing ore for his retort furnace in the nearby Mount Tobin district. At the latter point he has been producing mercury from claims purchased from and formerly operated by W. H. Gould & Co., of San Francisco. The new claims are known as the Jack Pot group.

UTAH

NLRB order on company unions upheld by Denver court—Smoke problem studied at Garfield

▶ The order of the National Labor Relations Board directing Kennecott Copper Corp. and Utah Copper Co. to cease alleged company interference with employee unions was upheld in a two-to-one decision by the Tenth Circuit Court of Appeals on Dec. 7 at Denver, Colo. The court also ordered enforcement of the NLRB ruling for disestablishment of the Independent Association of Mine Workers, the Independent Association of Mill Workers, and the employees' general committee, allegedly dominated by the company. The NLRB charged that the companies engaged in unfair labor practices in connection with the naming of an employee bargaining agent. The associations, the court said, aligned themselves with the employers in their answer. Judge Orie L. Phillips dissented, stating that NLRB findings were not supported by substantial evidence and that statements made by foremen and other supervisory employees were not authorized by the company. Besides the independent employee groups, the International Union of Mine, Mill and Smelter Workers, a CIO affiliate, has organized the employees.

▶ Tintic Standard Mining Co. paid a divident of 10c. a share to stockholders on Dec. 23, totaling $114,009 and bringing the grand total of disbursements up to $18,836,072.82.

▶ Park Utah Consolidated Mines Co. reports a net profit of $197,158 for the first three quarters of 1943, after depreciation and a provision of $60,069 for federal taxes but before depletion. This total is more than double the net profit for the same period in 1942, amounting to $82,807.

▶ Residents of the Magna-Garfield area have organized a 21-man committee to raise $25,000 to combat the smelter-smoke problem. George Cromar, Magna, committee chairman, announced that a $25,000 fund would be raised to employ experts to study means of eliminating the smoke. Data will then be presented to government officials and to officers of American Smelting & Refining Co., operating the smelter at Garfield.

COLORADO

Argo tunnel needs repairs—New WPB branch in Denver—Treasury tunnel gains 50 ft. daily

▶ George K. Kimball, mining engineer, who has been mining in the Idaho Springs-Central City area for nearly 50 years, warns that unless certain repairs are made to the Argo tunnel, which has its portal just below Idaho Springs, it will be lost to the mining industry of this section. The action of the WPB in closing the gold mines of the nation has had a disastrous effect on the tunnel, which was driven from Clear Creek canyon to the gold and silver producing California and Old Town mines, in Gilpin County. This tunnel, nearly 22,000 ft. long, has a cross-section 8 x 14-ft. for 14,000 ft. and 8 x 8-ft. the rest of the way. At this time certain repairs, caves that are backing up water, and drainage ditches must be taken care of. The Old Town mine has been one of the best leasers' mines in Gilpin County, for at one time 49 sets of leasers were working there. The skip at this mine was recently lowered to the 1,500-ft. level for the first time since the shaft caved between

the ninth and tenth levels on Labor Day, 1916. The timbers below the 1,300-ft. level down to the tunnel level were found intact, but the rails were entirely gone as a result of the acid waters in the tunnel. The shaft is over 2,200 ft. deep. The 4,300-ft. Old Town mine lateral extends west from the Argo tunnel at the 15,000-ft. point, and was the first opening to the surface the tunnel had. This eliminated pumping air in the tunnel. Since the cave in the tunnel at the Gem mine, 7,800 ft. from the portal, the air has been cut off completely, and the draft is going down the Old Town shaft and coming out the California or Concrete shafts, which are higher. George Collins, of Denver, has been looking after the Argo tunnel.

▶ Current reports state that John R. Austin is pushing the Treasury tunnel bore at the rate of about 50 ft. per day, and that there remains about 2,500 ft. to drive. The Barstow tunnel, parallel to the Treasury and 3,000 ft. north of it, is being opened up to serve as a drainage and ventilation tunnel for the main bore, with which it is connected. The 250-ton Treasury mill is being placed in operating condition so that ores encountered can be milled while the rest of the tunnel is completed and the raise driven.

▶ Alex Michaelson and associates have taken a lease on the Gold Belt property, near Silver Plume, and will start drilling as soon as the clean-up work is completed. William Buckley, of Silver Plume, is owner of the Golden Belt mine.

▶ Arthur Portenier, of Idaho Springs, is reopening and retimbering the main shaft of the Franklin mine, in Gilson Gulch. He also operates the Humboldt and Freighter's Friend mines near by.

▶ The joint convention of the American Mining Congress and the Colorado Mining Association will meet in Denver in late January to consider current problems of mining and treating critical metals; likewise the future of gold and silver will be a topic of considerable discussion. Among those who will take part in the meetings will be Howard I. Young, president of the Congress and head of the Minerals Bureau of the WPB; Charles M. Bell, president of the Association; Robert Hardy, of Spokane, Wash.; D. D. Moffat, of Salt Lake City. and many others. Chairman Harvey L. Tedrow, of Alma, Colo., has arranged an excellent program and some real entertainment.

▶ Two shifts are now working the Gold Cup mine, in Chase Gulch, and Tony Babish, of Idaho Springs, is having the ores treated at the Clear Creek Gilpin custom mill.

▶ Road construction in North Fork Gulch, near the old town at Shavano, has made it possible for C. L. Winnburn and Ralph DeGrazio to continue shipping zinc-lead ore from their property.

▶ The gold-mine operators and lessees of the Cripple Creek district have donated a carload of gold ore to the War Chest drive. The Portland, Ajax, and Vindicator mines each donated an equal tonnage of their best-grade ore and other operators and lessees cooperated to make the carload.

"The Toughest Steel Known" Is Often a "Must" Underground . .

The destructive effect of various ores on the wearing parts of underground mining equipment is a challenge to any steel, but austenitic manganese steel can meet it successfully. Equipment which definitely requires this steel in its wearing parts to afford maximum resistance to fracture and wear is the mine scraper or slusher used for dragging ore from the working faces to the loading chutes or cars.

Here abrasion and breaking stresses and, in many cases, 24-hour-a-day service impose conditions that can only be met by parts that are wear and shock resistant to the highest degree.

Maintenance underground is excessively costly. The handling of parts to out-of-the-way chambers, repairs in cramped corners, poor lighting, lack of proper tools for the job, lost production time —all add something to the maintenance bill.

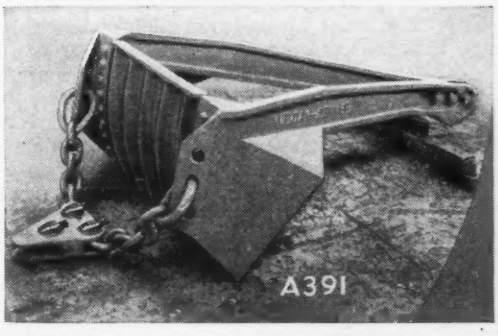
One way by which operators have helped reduce these costs to a very minimum is by using cast Amsco manganese steel for all parts which must withstand impacts and grinding wear.

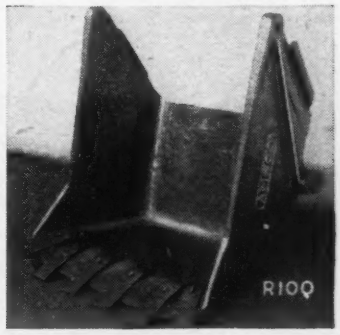
Picture A-418 shows a slusher bucket, equipped with manganese steel lip, for a lead and zinc operation. The customer asserts that manganese steel castings outwear carbon steel or chromium steel lips about two-to-one.

Picture R-100 shows a manganese steel dipper for a Goodman-Conway underground shovel.

The scraper shown in A-391, one of several sizes made by the Vulcan Iron Works of Denver for numerous underground operations, is made of Amsco manganese steel.

Ask for Bulletin 743-M, Manganese Steel for Mining and Quarrying Equipment.





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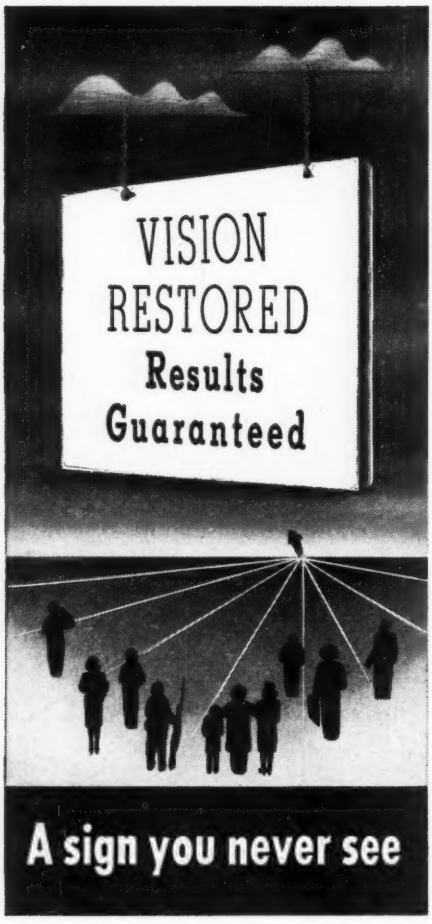

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Colorado *(continued)*

The gross proceeds of this carload of ore are to be presented to the War Chest. There will be no railroad charge for transportation and no treating charge at the Golden Cycle mill, at Colorado Springs.

▶ The Kentucky Belle mill has been moved from Alma to the Chaffee County Fluorspar Corp. property northwest of Salida; and B. F. Alexander has a gang excavating and laying mill foundations. The mill will use gravity concentration. This property when completed will employ about 40 men. At the annual stockholders' meeting of Chaffee County Fluorspar Corp., the following directors were appointed: Peter L. Bancroft, A. D. Argys, Len V. Chandler, Tom Politz, John A. Hall, Theodore Anderson, and S. W. Azar.

▶ A. R. Rhine, manager of the Lucky Strike mine, at Kokomo, will step up production as soon as additional miners can be obtained. Richard E. Mackey, of Kokomo, is superintendent. The mine has been producing about 35 tons of zinc ore daily.

▶ J. Reed Lane, after spending two years in Washington, D. C., with WPB, as assistant director under Howard Young of the Mineral Resources Board, has been appointed head of the new mining division of the WPB in the Denver regional office. Karl Schwegler, formerly in charge of WPB mining activities in San Francisco, will be Lane's assistant, and W. Earl Greenough, of Salt Lake City, will likewise be an assistant. The duties of the new office will be sixfold, namely: (1) to examine mine properties in connection with serial number applications; (2) to obtain and provide technical information for both WPB and mine owners on questions concerning priorities for new mining machinery; (3) to disseminate information to mines and smelters on WPB rules and regulations; (4) to advise and assist mine owners in their transportation and manpower problems and to aid them in all dealings with other government agencies; (5) to assist the industry generally in maintaining full-capacity production; (6) to make investigations and recommendations on adequate repair and maintenance requirements of the industry.

▶ Stuart McKee, after completing a year's development and exploration work of newly discovered orebodies in the Old Elkhorn mine group near Boulder, has the property in condition to justify added development work and a new mill. Early-day mining and development work carried to the 2,300-ft. level from the original Elkhorn inclined shaft. During the past 18 months complete and modern electrical installations have been made at the Sophis vertical shaft, approximately 360 ft. in the footwall dolomite of the Elkhorn orebody. This mine has yielded ore assaying as high as 3,000 oz. of silver per ton, 20 percent lead, and 15 percent zinc.

▶ The Golden Fleece mine, above Lake San Cristobal (Gunnison section), has been purchased for taxes by H. E. Moore. This famous old mine has a production record of over $3,000,000, and was the property that caused the first stampede to the San Juan Country. Nearly 70 years ago the mine was located as the Hotchkill mine, by Enos and Monett Hotchkill, W. C. Lewman, B. S. Barthoff, and Henry Finley; and their assays proved the property to be very rich in telluride ore. Then before the rich strike was made, George Wilson secured a workman's lien on the property, and obtained a judgment; and, together with Sam Wendell, later relocated the ground as the Golden Fleece. Then in 1892, Charles H. Davis leased the mine, and opened a large vein of rich telluride ore, which was sacked and shipped direct to Denver. In July of 1892 one carload was valued at more than $19,000. In Sept. 1892 the mine was sold to banking and smelting interests in Denver, who developed it into a rich producer.

▶ The Harrison-Croesus shipped a carload of concentrates to the smelter in Salt Lake City during the second week of November.

▶ Emmet and George Baumgardner have opened up a commercial grade of manganese ore in the Brooklyn mine, near Ouray. Further development and exploration are necessary before the importance of the strike can be determined. The property was formerly mined for its gold, silver, lead, and copper values.

▶ E. E. Zingheim, of Canon City, who controls and manages the Devils Hole Mining Co., a producer of feldspar, beryl, and scrap mica, reports that a 6-mile road has been constructed to the property by the grazing service, and this will help speed up his operations.

▶ Mr. Roberts has taken a lease on the Conejos Mining Co., in the Gunnison territory, and is busy getting machinery and men lined up. The mine, worked years ago, has been allowed to fill with water, but it will now be dewatered and development and operating plans set up.

▶ Luther B. Eames has returned to Denver from Deadwood, S. D., where he has been managing Canyon Corp. a number of years.

▶ The Franz mine, at Greenville, is showing increased values, and now that the harvesting season is over the mine crew is being increased. The company hopes to ship a car of ore per week.

▶ Cole Godsey is sinking 400 ft. at the Widow Woman mine near Idaho Springs in order to connect the tunnel and vein.

▶ Kendall & Wagner, of Seattle, are operating the Anglo Saxon tunnel, near Georgetown, under the name of Dunbarton Mining Co. This lead-zinc-silver property has encountered some good ore.

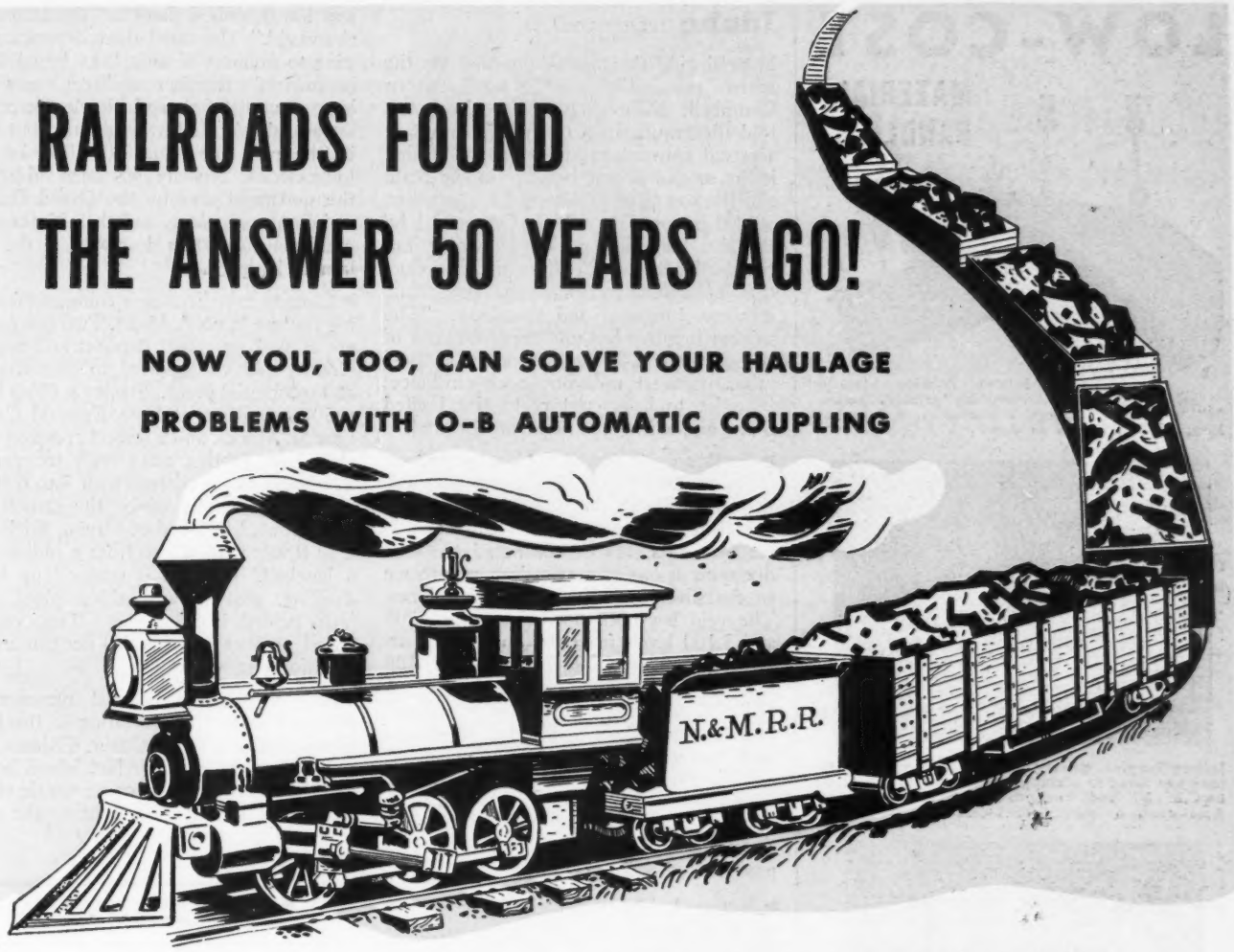
IDAHO

Chester vein developed further—Garnets mined in north Idaho—New lease for Liberal King

▶ "Idaho miners have done a big job and have done it well. The mining fraternity is to be congratulated for its important part

RAILROADS FOUND THE ANSWER 50 YEARS AGO!

NOW YOU, TOO, CAN SOLVE YOUR HAULAGE PROBLEMS WITH O-B AUTOMATIC COUPLING



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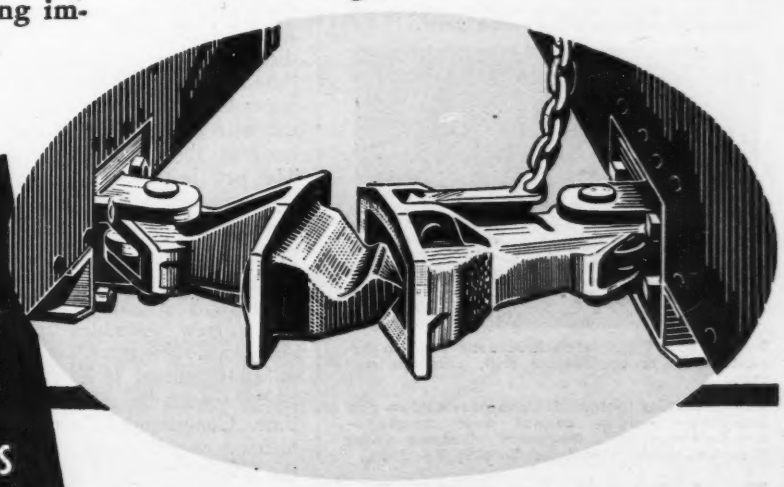

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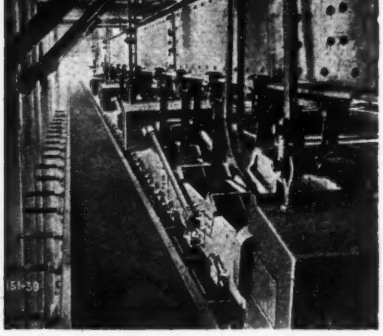
Jeffrey-Traylor grizzly feeder discharging 250 tons per hour to picking belt conveyor. Separation at 3" and fines are by-passed crusher. Also open or totally enclosed pan feeders.



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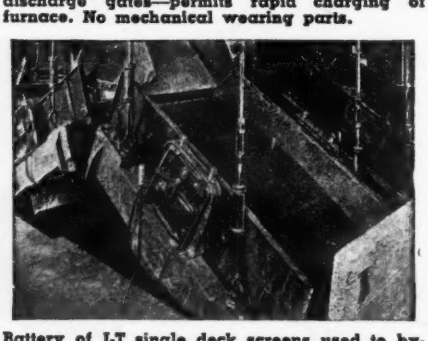

Battery of J-T single deck screens used to by-pass fines in conjunction with crushers and rolls.

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Idaho *(continued)*

in producing the minerals needed for the speedy prosecution of the war," Arthur Campbell, Idaho State Mine Inspector, told the mining men of the Northwest at a recent convention in Spokane. "Mining is the second largest industry in the State and the source of livelihood for more than 50,000 persons," he stated. Continuing he said that Idaho had made a great contribution in the all-out war effort in the production of antimony, cadmium, lead, zinc, mercury, tungsten, and vanadium. "The mining industry has met every demand of the government for the production of these minerals under unfavorable circumstances in order to bring victory to the United States and allies," the inspector declared.

▶ Further development work on the newly discovered orebody in the Chester vein, carried on by Sunshine Mining Co. under operating agreements with Polaris and Silver Syndicate, has demonstrated that the disclosure is one of outstanding importance to the silver belt of the Coeur d'Alenes. The vein has been opened on the 2,700 and 3,100 levels from the Sunshine shaft. Drifting on the vein for 70 ft. on the 3,100 level produced ore having a value of $51,878, according to W. M. Yeaman, president of Silver Syndicate. Operating costs were $16,428, leaving a net profit of $35,449. Ore shows across an 8-ft. face. A raise to the 2,700 level was in ore, proving the values for an additoinal 400 ft. on a vertical plane. Average values are 25 percent lead and 50 oz. silver per ton.

▶ Increased shipments of lead-zinc ore are reported from the Champion mine at Mackay, eastern Idaho, where Joe Ausich is in charge of the operations. A 9-ft. vein of ore was recently disclosed in the lower workings.

▶ Stockholders of Liberal King Mining Co. have been called to meet at Wallace, Idaho, on Dec. 30 to pass upon a lease and option recently granted Edward L. Greenwood and Albert Lobe, both of Seattle. The lease is proposed for 10 years at a royalty of 15 percent net smelter returns, and the option to purchase the property is for $300,000. The property is in the Pine Creek belt, a few miles west of Kellogg, and has been extensively developed with a shaft, now down 1,000 ft., and several thousand feet of drifts and crosscuts. The upper levels of the vein carry commercial values in copper-silver ore and the deeper horizons show chiefly lead-zinc content. The new leasers are preparing shipments of copper from the 400 level.

▶ The Whitedelf mine, at Clark Fork, Bonner County, is to be reopened for shipments, according to reports from the management. The shaft is being pumped out and a crew assembled for underground operations. The mine has produced a considerable amount of lead-silver ore in the past few years but has been idle for some time. Congressman Compton I. White is manager of the company. Other mines in the Clark Fork district are the Hope and Lawrence, both under steady production.

▶ Dr. Paul J. Raver, Bonneville power administrator, recently made a survey of the phosphate desposits in Idaho and Montana and has described them as "the largest in the world." He stated these deposits, running to millions of tons, "can be used for commercial fertilizer industry provided large amounts of cheap hydroelectric power are available." He further pointed out that in the past five years 1,000,000 kw. of hydroelectric capacity has been added to the northwest area by the Grand Coulee and Bonneville dams and that 25 times as much can be further developed in the Columbia basin.

▶ Garnets have become a commercial mining venture in north Idaho. Two companies are at work on garnet deposits in Benewah County and are reported to be operating at a substantial profit. Stanley & Craig have a 50-ton mill at work on Emerald Creek, near St. Maries, and a second company will soon have another plant ready to operate. The deposits are covered with 5 to 6 ft. of surface dirt, under which the garnets are concentrated in a bed of varying thickness. The stones vary in size from a pinhead to a baseball. Pay dirt is scooped up by a dragline, sent to a crushing plant, and later treated like lead ore. The concentrated product sells for $50 per ton and is used for abrasive purposes.

▶ W. A. Beaudry, general manager of Sidney Mining Co., operating in the Pine Creek district of the Coeur d'Alenes, reports the orebody on the No. 5 level below the shaft collar has a stoping width of 23 ft. The mine sent 1500 tons to the concentrator last month.

WASHINGTON

Northwest Mining Association favors free enterprise — Federal tests scheelite prospect

▶ Northwest Mining Association, at its 49th convention in Spokane, Dec. 3 and 4, took vigorous positions that were more or less national in its stand on present and postwar mining problems, including stockpiling of metals, the unrestricted privilege of mineral locations, federal taxes, social security, and the privilege of "free enterprise" as mining men have enjoyed it. "We are preaching the gospel of freedom, including freedom of individual effort," James L. Leonard, mining engineer and president of the association, said. "There is grave need for the mining industry to be on the alert as it never was before," said Dr. Francis A. Thomson, president of the Montana School of Mines, when he presided at the banquet Saturday evening. "A situation in the postwar world demands most serious consideration of national and state governments if we are to prevent a collapse which will result in unemployment and actual bankruptcy for many industries which have taken risks in response to the war demands for metals."

This convention was decidedly different from any of the 48 which have preceded it. It was called a "Mining Men's Town Meeting." Stanly A. Easton, president of Bunker Hill & Sullivan Mining & Concentrating Co., was honor guest and spoke with optimism on the future of mining

and felt that there was not the danger to industry ahead which some have feared. Charles E. Marr, president of Sheep Creek Mines Co., the new president of Northwest Mining Association, was introduced by James A. Ford, manager of the Spokane Chamber of Commerce, at a meeting where Mr. Leonard and Walter J. Nicholls, chairman of the mining bureau of the Spokane Chamber of Commerce, presided. Presiding at different meetings of the Association were W. M. Yeaman, of Yakima, president of Clayton Silver Mines Co.; R. D. Leisk, manager of Sunshine Mining Co.; C. A. R. Lambly, superintendent of Pend Oreille Mines & Metals Co.; and H. G. Washburn, of Wallace, Idaho, manager of Federal Mining & Smelting Co. Speakers included J. B. Haffner, manager Bunker Hill & Sullivan Co.; Edward P. Ryan, president Leonard, Matthews & Ryan; Therrett Towles; Frank Eichelberger, mining engineer; John J. Curzon, manager Chelan division of Howe Sound Co.; Frank E. Woodside, manager British Columbia Chamber of Mines; Judge Lon Johnson, of Stevens County; Sheldon Glover, supervisor of mining in Washington, and Dr. Harold E. Culver, supervisor of geology in Washington. C. O. Dunlop, president Silver Dollar Mining Co., was convention manager.

Donald A. Callahan, of Wallace, Idaho, vice-president of the American Mining Congress, was speaker at the principle mining luncheon. He was also chairman of the resolutions committee. Resolutions adopted recommended that the mining industry be permitted to set aside, tax free, a fund for prospecting and developing orebodies to replace those depleted in the war efforts; that the dumping of surplus unfrozen stocks of metals and ores upon the market be prevented by limiting imports of foreign metals to what is necessary to make up deficiencies of domestic production; and that the Scrugham stockpiling bill be passed by Congress. Other resolutions favor a provision for financing those gold-mining operations whose funds have been depleted by enforced shutdown, and that the time-honored policy of location of mineral lands be adhered to. The Hatch bill was disapproved, and a resolution suggested that federal provisions relating to excess profit tax be limited to war profits. Further resolutions asked that Congress be limited in its power to levy excessive income taxes; stated that present policy constitutes a serious threat to enterprise, glorifies the federal government at the expense of the states, results in centralization of government, and consumes the substance of production in the maintenance of a vast bureaucracy.

It was in addition recommended that social security taxes be frozen at present rates; that Congress defeat the attempt to establish freight rates by zones; that the present system of freight rates be retained; and that the Association pledge itself to fight for the maintenance of free enterprise for our returning soldiers.

► Light metal-alloy work on the campus at Washington State College, according to Prof. Eri B. Parker, manager of the college foundry, who has returned from the Cleveland conferences on magnesium production, will become of increasing im-

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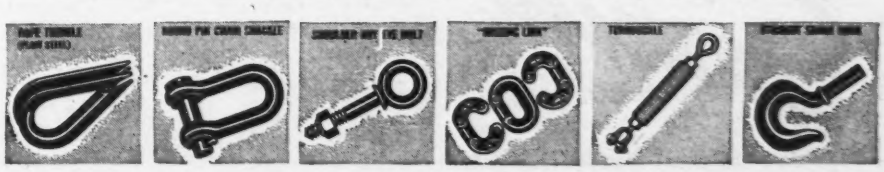

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Washington *(continued)*

portance. The college will make a survey of its facilities for helping the research program of the WPB in the magnesium field.

▶ Sierra Zinc Co., at its property near Aladdin, Stevens County, is producing a 60 percent zinc concentrate and a 70 percent lead concentrate. Truman Higgenbothan is manager.

▶ The first of the two federal housing projects at Metaline Falls is due to be ready for occupancy soon, but the second one is meeting with delay. The first will accommodate 35 single men. The completion of the second project to accommodate married men was set for Dec. 1, but several delays have occurred. The water system and sewage disposal plant have not been put in and may not be until after the cold weather. Delays are said to have been caused by a lack of labor and the slow arrival of materials. Pend Oreille Mines & Metals Co. and Metaline Mining & Leasing Co. are ready to add more men to their forces when these housing projects are available.

▶ Five carloads of ore from a deposit northeast of Newport are being shipped to the Spokane magnesium reduction plant for a test run. Option on the property has been granted by Mrs. Kathryn Grover to Western Minerals Co., of Spokane. If the tests are satisfactory, Western Minerals Co. will employ about 20 men in mining and processing the mineral.

▶ Federal Mining & Smelting Co., of Wallace, Idaho, has a crew, under Clem Pollock, investigating a scheelite showing at Kelly Camp, 20 miles northwest of Republic. The Federal company had its attention called to the deposit by the Washington Division of Mines and Department of Conservation.

▶ Willow Creek Mining Co. has suspended operations at its property, near Northport, pending a decision on its application for additional federal funds. The government has already advanced $30,000 for preliminary work.

TRI-STATE

CIO wins at Evans-Wallower—Complete dewatering Oronogo mines—Glennray to build 300-ton mill

▶ Mine operations are being carried on at a new shaft completed a few weeks ago by Eagle-Picher Mining & Smelting Co. on the Decker land, a half-mile northeast of Wentworth. A derrick and hopper have been erected at the mine, and ore is being trucked to the company's Navy Bean mill, 3 miles west of Wentworth. The company is operating nine prospect churn-drill rigs in the Wentworth area and two in the Diamond vicinity.

▶ Employees of Evans-Wallower Zinc, Inc., operating mines and mills between Cardin and Picher, early in December voted 106 to 36 in favor of the International Union of Mine, Mill & Smelter Workers, a CIO affiliate, as their bargaining agents. The election was held under the direction of representatives of the NLRB. The employees of St. Louis Smelting & Refining Co., Federal Mining & Smelting Co., Kansas Explorations, Inc., Oronogo Mutual Mining Co., Fenix & Sons, Rialto Mining Corp., and M.&W. Mining Co. are also now represented by the union.

▶ After several months of pumping, Eagle-Picher Mining & Smelting Co. has completed the dewatering of the lower levels of the Oronogo mines, which were flooded last May. This will permit the shipment of larger tonnages of ore for treatment at the company's mills in Oklahoma.

▶ F. W. Evans is dewatering the Walker shaft, on the McBee-Martin boundary line, a half-mile north of Smithfield. The shaft was sunk to a depth of 145 ft. last year by Barney Walker, of Joplin, and associates, with funds obtained on a government loan. The government later foreclosed on the property, after which it was acquired by Evans. Two 8-in. turbine pumps, powered by diesel engines, are dewatering the mine. Upon completion of dewatering, the mine workings will be lowered to around the 150-ft. level, as the ore is believed to continue to that point. Evans has under lease 171 acres of the McBee land, 328 acres of the Martin, and 70 acres of the Bolin land. The McBee tract adjoins the Martin on the northwest, and the Bolin is to the south. A half-mile to the east, Glenn Richey and associates have been mining a rich body of zinc ore on the Ellis land during the last year. The Richey Mining Co.'s derrick-hopper and other mining equipment were destroyed by fire a few months ago. Meanwhile, the company has sunk a new shaft to about the 140-ft. level, and installed new mining equipment including an 8-in. turbine pump to handle the water. St. Louis Mining & Milling Co., near Thoms Station, has been milling the Richey ore, and Evans plans to truck ore from his nearby development to the company's old R., H. & G. mill at Waco.

▶ Glennray Lead & Zinc Co. has completed plans for building a 100-ton-per shift mill on the Brugger land, a mile northwest of Baxter Springs, according to W. A. Martin, of St. Louis, who will be in charge of the construction. The company recently reopened a shallow shaft, about 37 ft. deep, and sunk it to the 74-ft. level. Lead ore, averaging 3 to 4 percent in recovery values, was encountered at the 52-ft. level and continued to the bottom of the shaft, Ray Barron, of Joplin, who is interested in the company, reported. The mill will be built on the site of the old Ramage mill, and it is planned to retreat some of the tailings on the 113-acre tract as well as mine ore, Barron said. Associated with Martin and Barron are J. V. Reynolds, of St. Louis, and G. S. Jourdon and Dean Whaley of Joplin.

▶ Tri-State mines and mills were shut down on Christmas Day, but ran uninterruptedly on New Year's Day.

ARKANSAS

Zinc field activity decreasing—U.S.B.M. drilling in Newton County—Manganese output rises

▶Zinc mining in the North Arkansas field reached its lowest ebb for the year in December. Only one mill is in operation, although more than 30 were running in the second year of the first World War. A number of prospective operators who have been waiting for the last year for government loans have departed because the loans were refused.

▶The Bureau of Mines is conducting test drilling with churn drills in the field. The engineers have completed their work on the Hurricane mine, in Searcy County, and are drilling on the Speer property, in Newton County. They encountered some ore on the Hurricane and have also found some ore on the Speer. They will move their rigs soon to the Coon Hollow property, in the Zinc, Ark., area and do some test drilling there. J. R. Thoenen, district engineer, Little Rock, and E. D. Gardner, resident engineer, Rolla, Mo., have recently made inspections of drilling operations in the field.

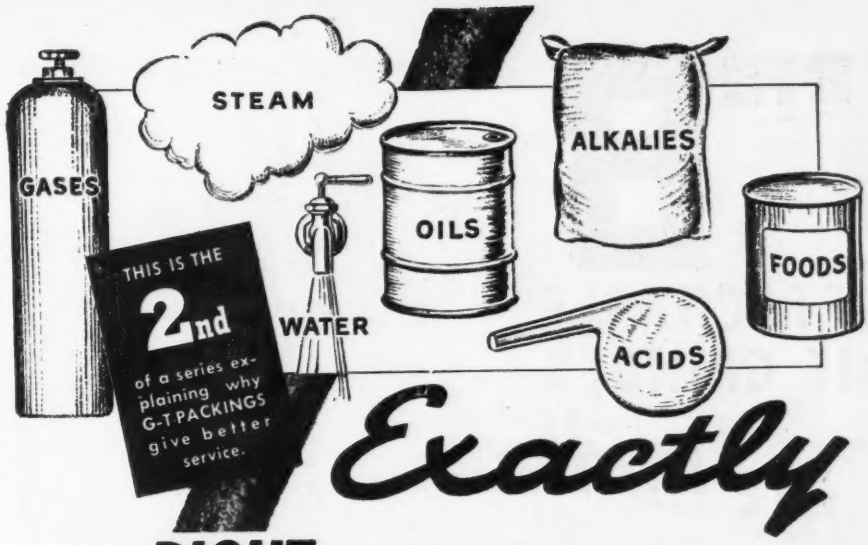
▶Moark Mining Co., with operations in charge of C. T. Rabineau, operating the Almy, Jackpot, Red Mill, and other properties in the Zinc, Ark., area is the only concern in the field now operating a mill. They expected to ship a car of silicate zinc concentrates in December.

▶Hall Mountain Mining Co., operations in charge of J. C. Jones, Yellville, conducting work on the Truex, Willet, and other properties in the Hall Mountain area, recently drove its tunnel into a big fault and encountered a good deposit of carbonate. As soon as the engineers develop sufficient ore, they will install a mill.

▶Silver Hollow Mining Co., operating the Silver Hollow and Silver Queen mines in the Rush Creek area, shipped a car of jack in November, but closed down operations in December for the winter.

▶Production of manganese ore in the Batesville-Cushman manganese field recorded a big gain in November over other months this year, as Metals Reserve stopped purchases of low-grade wad. November production ran approximately 1,443 tons, counting high grade and low or middle grade. Market demands for middle grades, running 30 to 40 percent, have increased, and shipments of this ore are being made direct to the furnaces. Ideal mining weather during the last 60 days also helped increase production.

▶Walter H. Denison Manganese Co., of Cushman, was the largest producer in November with 470 tons of high grade. This was the highest production of high grade made by any producer in the field in any one month in 1943. The ore was mined from the company's properties in the Pfeiffer area. At the present time it is sinking several new shafts which will probably come into production by Jan. 1.



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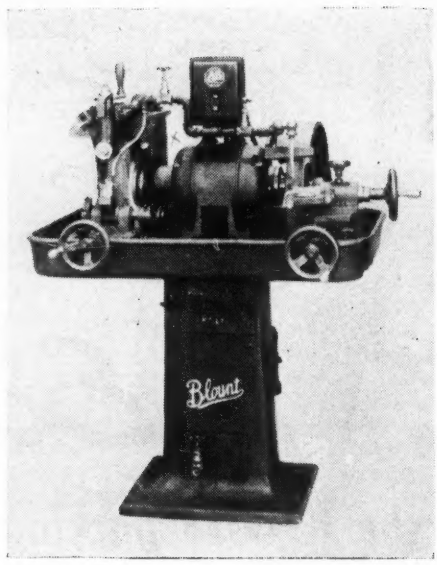

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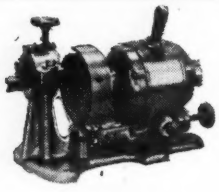

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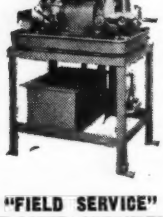

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Arkansas *(continued)*

▶ Par-Mar Engineering Co., of Batesville, James Wood, operating engineer, Max Cohen, work manager, has its new concentrator completed for operation in December. The plant was constructed on the Bayou in Batesville. This stream furnishes plenty of water for operations. Equipment consists of a large rotary kiln, which has been transformed into a washer; a set of sizing screens, jigs, and a sintering kiln. These will be powered with electric motors, and the sintering kiln will be fired with natural gas. This unit, however, will not be in operation for about two months. The plant will treat both low-grade oxides and carbonates. The company produced approximately 100 tons of high grade in November and has about 1,000 tons of low grade stockpiled.

▶ Charles Sims, of Cushman, increased his production in November. He is now conducting operations on the Gray Hill, Turner, Waters, and Einstein claims. His November production ran approximately 250 tons, 50 tons of which was high grade and 200 tons low grade.

▶ Preston Grace and Marshall McGee, of Batesville, operating the Chin mine, in the Cave Creek area, produced approximately 200 tons of medium grade in November. They are now mining the ore from several shaft and drift mines and from a long tunnel well over 300 ft. back into the mountain. They have also proved up an enormous tonnage of low-grade wad, which is subject to beneficiation. They have recently employed Gene Holmes, of Glenwood, to install a sintering plant for them at Pfeiffer to treat their low-grade wad. Mr. Holmes installed a number of plants in the cinnabar field in southwest Arkansas. The plant will be fired with either fuel oil or butane gas.

▶ Major Ruggles, who was called home because of sickness in his family in October, has returned and is in charge of the buying depot for Metals Reserve. I. C. Watkins, who substituted for him in his absence, was called to Washington. Metals Reserve's two stockpile yards in Batesville are now full, and the company has rented another yard about 2½ miles west of Batesville, where present purchases are being stored. Metals Reserve is buying practically all of the high-grade ore produced in the field.

▶ Stanley Bourne and Ernest Stroud, of Batesville, operating the Austin mine near Mt. Pleasant, produced approximately 10 tons of pyrolusite in November, and their production in early December was running about one ton a day. Production is now being made from four shafts.

▶ Arkansas Manganese Co., operations in charge of Jack Gibbons, of Cushman, produced 263 tons from the Aydelotte property, near Cushman, in November. Eighty-five tons of the production was high grade and 178 tons low grade. Several new shafts are being sunk and December production will probably exceed that of November.

▶ Hendricks Mining and Milling Co., headed by A. C. Hendricks, of Batesville, has a new washing and concentrating plant nearly completed. It was scheduled to be in operation some time in December. This company operates the Polk Southard mine, near Cushman, and other properties. It produced approximately 150 tons of low grade from the Sis Clark mine in November. Its new plant is equipped with log washers, jigs, and tables. Power for the plant will be supplied with a 120-hp. diesel and a 90-KVA generator.

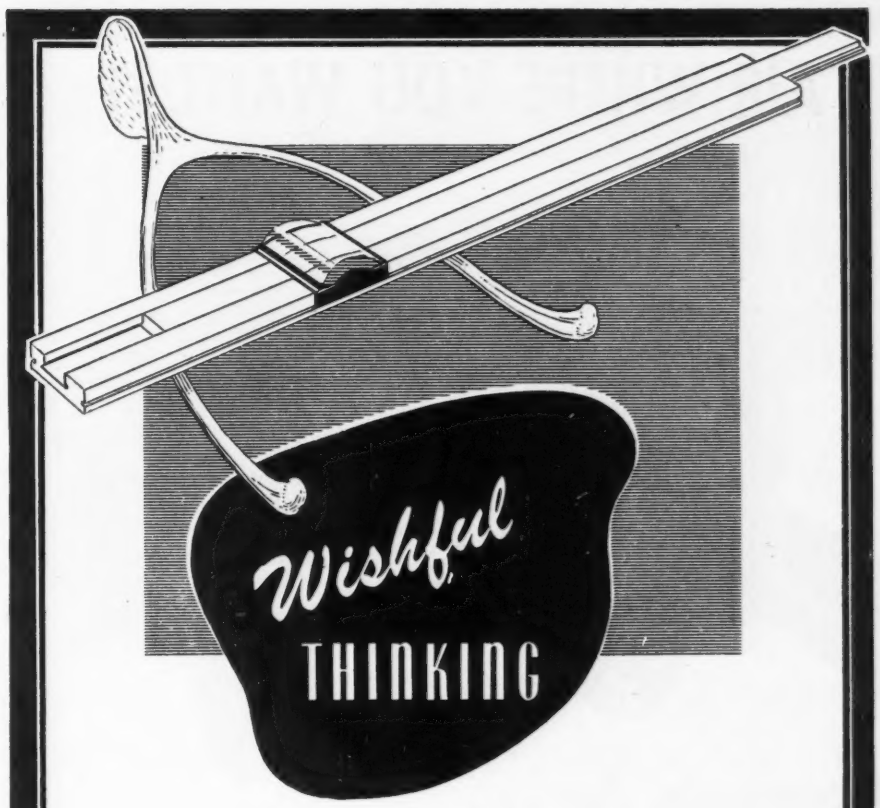
IRON COUNTRY

New research laboratory for Oliver Iron in Duluth—Ore dock planned at Port Arthur

▶ November shipments of iron ore from the seven Lake Superior district ports totaled 6,940,503 tons, bringing the season's movement up to Dec. 1 to 83,655,340 tons. Shipments in November 1942 were 7,582,425 gross tons and on Dec. 1, 1942, Lake Superior district ports had shipped 91,440,952 gross tons. The decline last month is attributed to the early arrival of cold weather, which required extensive steaming operations and slowed down loading.

▶ Plans for the establishment of a new iron-ore research laboratory in Duluth to centralize those activities of the Oliver Iron Mining Co., were disclosed recently with announcement by Le Roy Salsich, president, that the four-story Empress Coffee building in West Duluth has been purchased by the firm. Research facilities to be established there will enable the company to continue and intensify its improvement of Lake Superior district ores used by subsidiaries of United States Steel Corp. Mr. Salsich said that the company for many years has been carrying on a program designed to study means of improving ore now being mined and to make investigations of the concentration of lower grade formations for future use.

▶ At Port Arthur, Ontario, 209 highway miles from Duluth, a new link in the chain of iron-ore loading points on Lake Superior shores is developing. Headline news at the Canadian port city recently was the announcement that the Canadian National Railway is proceeding with the construction of a high-level pocket-type ore-loading dock at Port Arthur to provide facilities for the movement and handling of iron ore being developed at Canada's new iron-ore range, 140 miles to the west, at Steep Rock Lake. (See E. & M. J., for Dec. 1943.) The dock, to cost between $2,000,000 and $3,000,000, will be similar to those at Duluth, Superior, Two Harbors, and Marquette on Superior's American shores. To this loading point from the ore properties of Steep Rock Iron Mines, Ltd., a Canadian company backed by Cyrus S. Eaton of Cleveland, will flow annually hematite said to be comparable to the finest Swed-



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Iron Country *(continued)*

ish grades. It will be mixed at Lake Erie ports with Minnesota Mesabi range ore. Announcement of the dock project was made by C. D. Howe, member of the Canadian Parliament for Port Arthur and Minister of Munitions and Supply in the Dominion government. The money will be supplied to the railway by the Canadian government, he said, and the project will combine the building of a spur from the Canadian National main line near Atikokan to the mine site 6 miles to the north. The wartime development of the Steep Rock range is as important to Canada as was the discovery and mining of the Minnesota ranges. Although the world's leading producer of nickel, platinum, and asbestos, Canada has mined little iron ore in 16 years except for some mining at Michipicoten, for the reason that the deposits were hard to reach. The operations at the Steep Rock site also have been difficult, requiring a $3,000,000 engineering job to divert the flow of the Seine river through Steep Rock Lake, which is being drained of some 125,000,000,000 gallons of water. This entails the construction of dams, spillways, two rock cuts, a tunnel, and a canal. Then must come the removal of 150 ft. of clay and gravel overburden to lay open the ore deposits. A power line is being erected from Port Arthur to the mine. It has been said that production of the Steep Rock property is expected to be in full swing by next summer, when about 200 cars will move to the port each 24 hours throughout the navigation season of some 200 days.

▶ The biggest season in the history of the Chicago and Northwestern railroad ore docks at Escanaba, Mich., came to a close Dec. 3 when the steamer "Crawford" cleared with the final cargo. About 125,000 tons more than last year, or a total of 6,320,000, was handled. This increase was due to the dismantling of the Milwaukee road docks since the first World War when the port shipped more than 7,000,000 tons.

▶ Just why iron ore workers are classed as good risks and can secure life insurance at no increase in premium rates is clearly shown in report of county inspector of mines, Hjalmer Saari, for Gogebic County. During the fiscal year from Oct. 1 to Sept. 30 only one fatal accident occurred in mining 4,644,690 tons. Of the 925 accidents reported, 802 were too small to cause any lost time. This report covered 612,343 man-days of work.

▶ Just before the shipping season closed, a fire in the round house of the Lake Superior & Ishpeming railroad, located near the ore-loading dock at Marquette, Mich., damaged 11 out of 19 locomotives in the house and also the building to the extent of $75,000. The fire started in a locomotive cab and spread to the other machines before the city fire department could get it under control. No one was injured and no ore shipments were delayed.

▶ The Book mine, a new open-pit operation near Crystal Falls, Mich., operated

by North Range Mining Co., started shipping ore in July and completed its season on Nov. 27 with a total shipment of about 290,000 tons. During the summer a 24x36-in. jaw crusher was installed below a ramp so that all oversize could be crushed before shipping. Stripping of overburden started immediately after the ore season closed and will continue throughout the winter, using one 54-B Bucyrus shovel and seven or more 10-yd. Koering Dumptor diesel-driven trucks. All outside contractors have completed their work here and only equipment owned by the mine will be used in the future.

ALASKA

Alaska Gold & Metals to resume mining on Prince of Wales Island —Wage increase for Alaska-Juneau

▶ Alaska Gold & Metals Co. is planning to resume operations at its Salt Chuck property, on Prince of Wales Island, which is said to be the only producer of palladium in the United States or its possessions. This company has the Rush and Brown mine, adjoining the Salt Chuck, and also plans to put this gold-copper property into production. How much of this program it will be able to initiate and carry out during the war is not certain, according to A. L. Howard, president, but the company will do what it can and complete its program later. Expanded to capacity it will employ about 80 men, with a monthly payroll in excess of $20,000, he says. Equipment on the properties consists of a 600-hp. diesel, a 75-hp. water development, and a 300-ton flotation plant, besides railways, docks, and buildings. The U. S. Bureau of Mines has recommended a one-mile road to connect the two properties.

▶ The Twelfth Regional War Labor Board has ordered a horizontal wage increase of 14c. an hour for all job classifications of Alaska Juneau Gold Mining Co. Chairman George Bernard Noble submitted a dissenting opinion.

▶ Chrome Queen, near Seldovia, mined 5,000 tons of ore last summer. The chrome goes to a depot at Seldovia established by Metals Reserve Corp. The crew varied from 6 to 11 through the season. This property is closed down but expects to resume in May, after more drilling equipment, sorting tables, and cars have been secured. The owners are Robert Health, Ray Sharpe, and Herb Miller.

▶ Indications of a huge oil reserve in a 20,000-sq. mi. block of land are reported by Norman Ebbley, engineer of the U. S. Bureau of Mines and head of a party which spent a month in Alaska's Arctic slope. He made this report when he returned to Juneau in December. The location is 600 miles from Fairbanks. He says excellent seepage was found in six newly discovered areas, in addition to two previously known seepages.

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The scene was a wilderness with a rich deposit of ore buried beneath a lake. Efforts to mine by shaft methods were drowned out repeatedly. Then engineers went in with pumping equipment and Naylor Lockseam Spiralweld Pipe and literally "moved" the lake to distant natural drainage.

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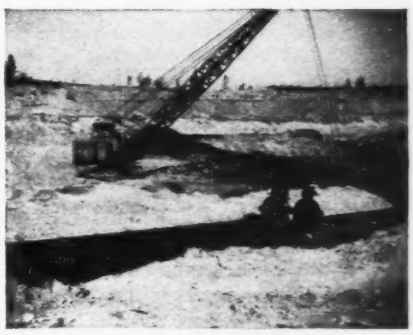
The light weight, greater ease of handling and installing, quicker connections, closer conformity to the terrain, leak-tightness, safety and, above all, the ability to handle pressures normally requiring heavier-wall pipe have made Naylor Pipe first choice on applications like this.


Naylor pipe from sump merges at valve station with main 20-inch line.

Naylor 20-inch pipe line is main discharge for mine water. Note conformity of pipe to terrain.

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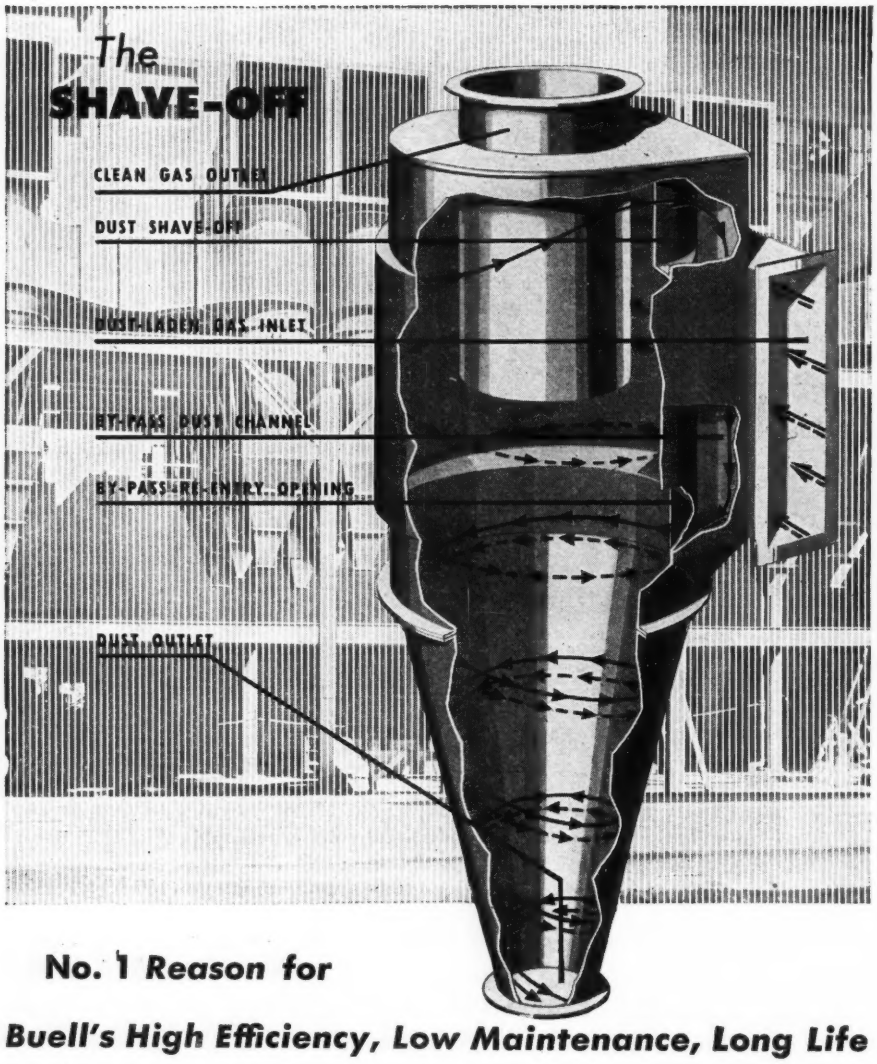

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Alaska *(continued)*

▶ New Idria Alaska Quicksilver Mining Co. is handling ore that runs 1½ to 2½ percent and is putting through 25 tons daily, according to Bruce Gould, president. The company put in a new furnace at a cost of $175,000 that went into operation Oct. 4. It has 25 men employed and operations will be continued through the winter. The main shaft is to be sunk another 50 ft. This operation is at Sleetmute. The fuel is wood, and enough was obtained for several months' run so that it might be seasoned. The quicksilver is being kept in storage for shipment in the summer to Metals Reserve Corp. This company claims to have the only quicksilver furnace in Alaska and that other producers use retorts. Harold Schmidt is mine superintendent.

▶ Walter Fisher, who has placer property at Grant Creek, reports that with the five men he employs he was able to continue production in 1943 about as in other years in spite of war handicaps. He says his operations have been reasonably profitable and he believes they will continue to be so.

▶ Mrs. James M. Irvine is forming a company to include her mining properties in the Nome and Seward districts of Alaska and in Calaveras County of California.

▶ Goodnews Bay Mining Co., at Platinum, closed down its dredging and dragline operations Nov. 6, and its men went south. They expect to return in March for the 1944 season. Alfred Gould is dredgemaster. This company's platinum production is said to be the largest in United States territory.

CANADA

Improved labor supply for mining —Beattie Gold Mines resumes— CIO gains influence in B. C.

▶ The appointment of a Magnesium Advisory Committee has been announced by George C. Bateman, Metals Controller. Headed by himself and the Deputy Metals Controller, the Committee includes: Dr. E. W. R. Steacie, National Research Council; R. J. Traill, Division of Metallic Minerals; and M. F. Goudge, Division of Industrial Minerals, all of Ottawa, and four other members representing industry. This group will be responsible for conducting investigations and advising the Metals Controller on the production, fabrication, and use of magnesium.

▶ In November a definite improvement was indicated in the supply of labor available for the mining industry. Though partly due to the release of farm workers, the trend is believed to reflect the general increase in the number of men who have been released from war industries. There has been a decline for several months in the number of employees at munition plants and shipyards. This trend has been reflected in a gradual improvement in the size of mine crews, and

increased employment has been reported by several Ontario gold producers and International Nickel Co. Sherritt Gordon and Hudson Bay Mining & Smelting, in Manitoba, also show substantial improvement in the number of employees. At Kirkland Lake it is estimated that upwards of 100 families returned to the town from industrial districts to the south. This gradual return is representative of other mining areas in eastern Canada.

▶ The index of industrial activity, as published by the Canadian Bank of Commerce (1937=100), moved up two points in mid-October to 209, compared with the previous month. Moderate gains were shown for the iron and steel trades, nonferrous metal products were unchanged, and a slight drop was recorded by the non-metallic minerals. The wage payroll index for September (1937=100) advanced to 98 from the August figure of 97 and was still well below the figure of 105 for September a year ago.

▶ A lecture series on a scale more elaborate than previously undertaken has been announced by the Prospectors' and Developers' Association. The scheduled meetings are to begin at the Royal York Hotel, Toronto, on Jan. 11 and conclude with the Vancouver meeting on March 6, which will be arranged jointly with the British Columbia and Yukon Chamber of Mines. The meetings have been organized by Mrs. Viola MacMillan, secretary of the Association, and will be held in Montreal, Port Arthur, Winnipeg, and Edmonton, as well as in local mine centers. About 100 speakers are to take part in the extensive program, including company officials and members of the Department of Mines of the Dominion and of the various provinces.

▶ Election results on Dec. 6 at Kirkland Lake served to demonstrate a substantial loss of popular support for the CIO, as compared with the popular following that was demonstrated by the election of two years ago. Popular opposition to the labor program resulted in the election of only one of the candidates. This appears to register a general satisfaction for the operation of non-union councils that have been set up at the various mines.

ONTARIO

▶ The third headframe to be built in Canada by the use of reinforced concrete has been completed at the Murray mine of International Nickel Co. Two other examples of this type of construction are in use at Hollinger Consolidated Gold Mines, Timmins, Ont., and at Mic-Mac Mines, east of Noranda, Quebec. The use of concrete, under present conditions, allows for a conservation of structural steel for essential war purposes, and the cost is similar to the standard steel design. The headframe, with a height of 153½ ft., is designed for skips carrying 12 tons of ore and traveling at a speed of 2,400 ft. per minute. Of the four compartments, two are for ore skips and two for cages, in addition to a large manway and pipe compartment. Lighting in the

An Important Message to

Technical Men

The war has carried the manufacturing age to a new peak! Production demands have created technical problems the like of which the world has never seen before! The services of engineers are at a premium. Especially the services of one particular class—executive engineers—*engineers with business training;* engineers who can "run the show."

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Golden Opportunity for Engineers

In this new era, the engineer with vision and foresight has a golden opportunity. He will realize that out of today's tremendous production battles will emerge technical men who not only will play a major role in winning the war, but who also will be firmly entrenched in key executive positions when peace comes.

However, before the engineer can take over executive responsibilities, he must acquire knowledge of the other divisions of business—of marketing, accounting and finance. He has of necessity a vast amount of technical training and experience. But in order to grasp the opportunities that present themselves today—to assume leadership on the production front—he must *also* have an understanding of practical business principles and methods.

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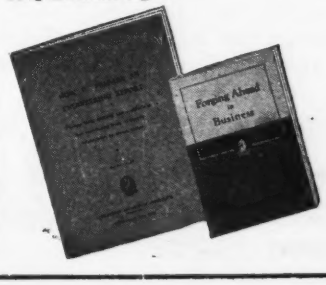

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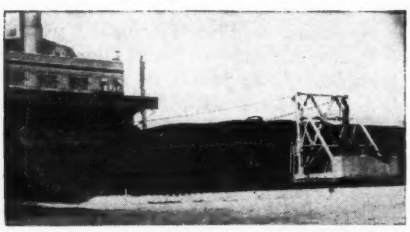

Above is a typical example of a Sauerman Scraper installation of large capacity with self-propelled tail tower as used at mines and processing plants for open storage of materials. This type of machine is able to cover a wide storage area, and handle a large tonnage both storing and reclaiming.

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Canada *(continued)*

manway is supplied by structural glass blocks. Construction of this headframe was under the supervision of L. M. Sheridan, chief engineer of International Nickel.

▶ A meeting of the board of directors of Cline Lake Gold Mines, held on Oct. 20, voted to wind up the affairs of the company and distribute assets to the shareholders. Mine operations were suspended in October a year ago and the mill clean-up was completed last December. Arrangements are to be made for reimbursing the parent company, O'Brien Gold Mines, the amount of the Cline Lake assets as shown on the balance sheet of the latter Company.

▶ Coin Lake Gold Mines is starting a program of diamond drilling on the newly acquired Slate Bay property in the Red Lake district. The work is to be under the supervision of W. P. Mackle, consulting engineer. Drill exploration has also been proposed for the group of claims adjoining Cockeram, Red Lake Gold Mines, and it has been planned to carry on a prospecting program after the break-up on two properties in the Lighting River area, recently taken over by Coin Lake. President of Coin Lake is W. M. Cochenour.

▶ Drill hole No. 33 on the Larder Lake property of Armistice Gold Mines has shown a promising ore intersection in a carbonate zone encountered below a depth of 1,018 ft. A 9-ft. core section was cut within a 20-ft. zone, averaging $5.60 a ton. Lower values were secured in a previous drill hole that was located 600 ft. to the east. It is planned to put down a series of holes for the purpose of tracing this zone systematically. Salter A. Hayden, of Toronto, is president.

▶ Promising possibilities are indicated for developing a new orebody close to the Pamour boundary on the property of Broulan Porcupine Mines. A 59-ft. width is exposed in crosscutting the new ore, in which a 20-ft. width assayed $14.95 a ton, after eliminating erratic high essays. Abundant visible gold was exposed in part of the section. A series of flat drill holes put out from underground workings on the Pamour almost two years ago were responsible for locating this promising area at a 600-ft. elevation, along the greenstone-greywacke contact. The possible length of the new ore within the Broulan boundaries is about 250 ft. This area is 3,500 ft. from the shaft. Walter F. Brown is mine manager.

▶ MacLeod-Cockshutt Gold Mines, with the mill rate reduced to 400 tons a day, is completing work on the headframe at the No. 1 shaft. The headframe was formerly part of the equipment at the Cline Lake property. After installation has been completed, it is proposed to open up four new levels to a depth of 1,750 ft. on the North orebody below the section that has indicated an ore content of 2,200 tons per vertical foot. Favorable possibilities have been indicated for the depth program by John A. Reid, consulting engineer, in charge of the exploratory work.

QUEBEC

▶ Early in December milling was resumed by Beattie Gold Mines at a rate of upward of 300 tons a day, with the prospect of doubling this rate in January and making further increases in March. By that time it is expected to have the new 1,000-ft. shaft in the Donchester section completed, located about one mile east of the main shaft. After shutting down production in June as a result of a large volume of boulder clay slumping into the open pit and blocking the mine workings, a program of rehabilitation has been under way. Work has been delayed by shortages of both labor and equipment. An ore dump of upward of 10,000 tons has been accumulated from development work on the Donchester vein on the 1,000-ft. level, where four stopes are being prepared. Shaft sinking was last reported at a depth of 450 ft. and raising was started in December to speed up the program. W. B. Maxwell is president and general manager and Jay Tuttle is general superintendent.

▶ Plans for extensive exploratory work on the large property of Obalska Mines have been announced by the president, G. R. Burge. The company, controlled by Frobisher Exploration Co., has laid out a program that includes a magnetometer survey and diamond drilling. The property, of 25 claims in Louvicourt Township, is known to have a section more than 300 ft. in length where promising gold values occur. Previous drilling and trenching tested an 800-ft. length on the favorable contact zone that is now to be given further systematic study and investigation.

▶ An examination of the property of Gan Copper Mines, north of the Aldermac ground, has been made by Dr. G. F. Flaherty, consulting geologist, who has recommended diamond drilling. The area of dalmatianite, covering several acres, has been found to be similar to structures on the Waite Amulet holdings and is believed to be favorable for deposition of copper-zinc ore.

▶ Preliminary estimates of ore reserves at Siscoe Gold Mines indicate reduced tonnage and grade, according to a statement by the president, J. B. Lynch. Costs have been reduced to a minimum in an effort to continue profitable operations. Exploratory work has failed to open up any substantial new tonnages, and a steady revision downward has been necessary in estimating the value of reserves. The mill rate is being maintained at a capacity of 1,000 tons a day in an effort to hold operations on a profitable scale. Exploratory drilling is now in progress on the optioned property of Durbar Gold Mines in Beauchastel Township, under the supervision of Dr. A. W. Derby.

BRITISH COLUMBIA

▶ Problems of employee representation are currently among the most troublesome for British Columbia mining companies. By passing a new provincial Labor Act which specifically prohibited "company" unions, the B. C. Legislature aided materially the

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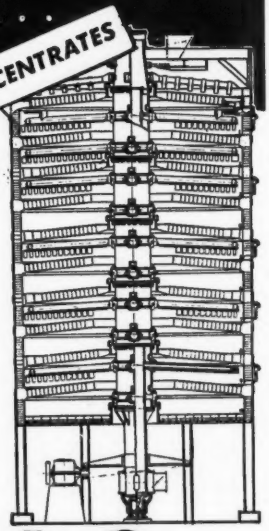

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Canada *(continued)*

hitherto unsuccessful campaign of the CIO to organize many of the larger B. C. mines, notably those of Consolidated Mining & Smelting Co. of Canada, Ltd. With 16 locals now established in B. C., it is likely that the international CIO Mine, Mill and Smelter Workers will become more firmly entrenched as the war progresses.

▶ A labor policy of 25 years' standing which had preserved amicable relations between management and labor at Kimberly, B. C., and other Consolidated operations (See *E. & M. J.*, Oct., 1943.), was scrapped recently under terms of an agreement between S. G. Blaylock, president of Consolidated, and C. J. Powers, executive board member of the MMSW. The union recently won an election at Kimberly and was established as the plant's bargaining agency under terms of the new Labor Act. All contracts, practices, and customs formerly obtaining between the company and the Employees Cooperative Committee are abandoned and new agreements will be negotiated. The CIO union is conducting an organizing campaign at Trail, B. C., in the hope of winning similar concessions there. Mr. Blaylock, in a statement recently made to the *Northern Miner*, said that Consolidated would do its best to make operative any collective bargaining agreement reached with a legally constituted agency, but he added that he felt that employees returning from the Army after the war would find fewer advantages under the CIO than they had enjoyed under the cooperative committees of which they had once been members.

Note. Arriving after the foregoing had been printed, a letter from Mr. Blaylock informs us that a government check at Trail has found the MMSW union lacking a majority there.

▶ Dr. J. F. Walker, Deputy Minister of Mines for British Columbia, has predicted $62,790,000 as the value of 1943 mineral production in this Province, a decline of $13,000,000 from that of 1942. Gold production, which reached its peak value of $23,698,000 in 1940, has fallen to approximately $9,300,000 and is continuing to recede; the present rate of production is less than $8,000,000 per year. Regarding the production of other minerals, Dr. Walker states:

"Silver production, which showed some promise of increasing a year ago, is down slightly from last year and is about 75 percent of the 1940 rate. Copper mining has been hard hit and production is down to the level of the depression years. It is 20 percent less than in 1942 and about 45 percent less than in 1940. The present rate of output is less than the average monthly production for the year to date and unless more labor is made available, copper production for 1944 will show a further decline. Lead and zinc are both down, but the decrease is not nearly as serious as that for copper.

"Coal production will amount to about 1,755,000 tons, or a decrease of about 200,000 tons from last year." The deputy minister anticipated the value of produc-

tion of non-metallic and industrial minerals to be about the same as that for 1942. Dividends, on the basis of payments made to date, he felt, would be in the vicinity of last year's disbursements of British Columbia mining companies. Declining production is due to the shortage of labor according to Dr. Walker, who states:

"The decline in value of mine output is only the reflection of a serious situation that is imperiling the future of the mining industry in the Province. The decline in value does indicate a decline in production in most things, but it does not indicate that our current production is in many instances being maintained at the sacrifice of development work. This is what finally shut down so many gold mines—production simply caught up with development. It means that the physical condition of many of the mines that have shut down, and of some of those still operating, is not what it should be, either to maintain production during the war or to permit competition in the postwar period. If production is to be maintained more men must be diverted to the mining industry, and if we are to be able to compete in the postwar world, still more men must be found so that our mines can be put back into the condition they were in when the war started. We appreciate to the full the necessities of war and the demands on labor and materials, but we believe that labor can be made available to our mining industry."

▶ Bralorne Mines, Ltd., leading B. C. gold producer, will pay its regular quarterly dividend of 20c. per share plus an extra dividend of 10c. per share on Jan. 15, 1944, to shareholders of record Dec. 20, 1943. The Takla mercury mine, in the Omineca mining division, financed and operated by Bralorne, commenced production on Nov. 27. Tuning up has now been completed. A contract directly with Metals Reserve Co. has enabled this development to mature in the face of a declining market for quicksilver. Failure to accept the product would call for a penalty to the purchaser, whereas failure to deliver a specified amount of mercury would constitute default on the part of the operator. Bralorne has a substantial stake in this strategic-mineral operation, and in addition has been compelled to jeopardize its gold production through the transfer of several key men from the Bridge River mine to the Omineca development.

▶ Pioneer Gold Mines of B. C., Ltd., has taken an option on a gold-tungsten prospect on Whitesail Lake, Omineca mining division. The metal values are contained in quartz veins of extraordinary size; the veins outcrop for more than 3,000 ft. and are reported to be as much as 150 ft. wide.

▶ Granby Consolidated Mining, Smelting & Power Co., Ltd., has intimated that it will close its Bromley Vale colliery, near Princeton, before it will concede the "closed-shop" clause in its contract with the United Mine Workers of America. Prior to this month all contracts in the Princeton district permitted "open-shop" arrangements, but the threat of a strike

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I-T-E and the Mining Field

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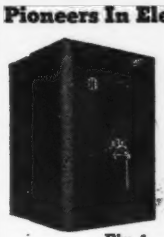

Fig. 1
Type KB air circuit breaker for mining service, available for both a-c and d-c circuits.

Developments of the past ten years in mining methods have led to a very wide use of I-T-E air-immersed circuit breakers and switchgear. Consistent study of mining problems has kept I-T-E in the forefront with the result that I-T-E equipment has been a vital factor in mechanized practices. An example of I-T-E efforts to prepare for new needs is the Type KB circuit breaker (Fig. 1)—an extremely compact and rugged circuit breaker capable of meeting a wide variety of service conditions.

Automatic Reclosing Circuit Breakers

I-T-E automatic reclosing circuit breakers with load measuring characteristics are widely used in mines where d-c trolley and feeder systems are employed and where overload peaks and faults arise frequently. Type KSA is for substation use in protecting and controlling semi-automatic or full automatic M-G sets, rotary converters and mercury-arc rectifiers. Type KSC is used in sectionalizing service to localize faults. Sectionalizing provides for maximum production at reduced cost for power, for electrical maintenance and machine repairs.

Fig. 2

Fig. 3

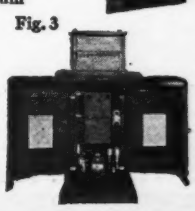

Fig. 2 (above) shows a Type KSA automatic reclosing circuit breaker for substation service. Fig. 3 (right) is a Type KSC automatic reclosing circuit breaker for sectionalizing service. Steel enclosure is open.

Automatic Switchboards For Mines

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Fig. 5
Type LDR Load Distributor, panel mounted, in glass front, dust-proof cover.

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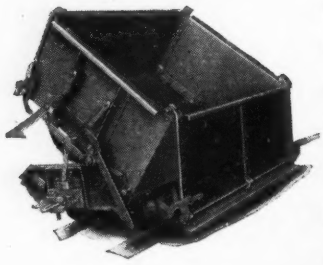

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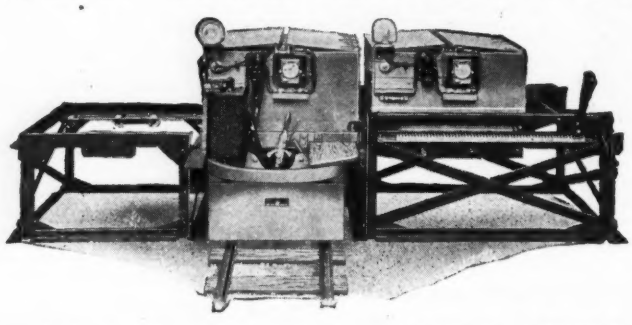

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Canada *(continued)*

to secure the "closed-shop" condition succeeded in gaining the concession from all other operators.

▶ About 60 men are employed in exploration and development work at the Hedley Mascot mine preparatory to resuming milling operations, which were suspended at the end of September. A new low-level tunnel is to be driven to provide easier access to ore below the main level. Despite the labor priorities enjoyed by the Mascot and Nickel Plate gold mines, on account of the arsenic content of their ores, there is still insufficient labor available for continuous mining and milling operation.

▶ Sheep Creek Gold Mines, Ltd., only surviving Nelson district gold producer, will pay a quarterly dividend of 3c. per share Jan. 15, 1944, to shareholders of record Dec. 31, 1943.

▶ The capital distribution of 8.4c. per share, authorized by Dominion tax authorities, recommended by company directors, and approved by shareholders of Ymir Yankee Girl Gold Mines, Ltd., will be paid Dec. 30 to shareholders of record Dec. 1.

▶ Bayonne Consolidated Mines, Ltd., experienced a deficit of $44,246 during the fiscal year ending Oct. 31, 1943. The principal item was $31,462 expended in option payments and development of the Blue Eyes tungsten group near Rossland. The Bayonne gold mine, at Tye, is being maintained in condition for reopening when more favorable conditions return.

▶ Consolidated Mining & Smelting Company of Canada, Ltd., is extending its phosphate plant at Trail at an estimated cost of $250,000. At the same time 18 more dwellings are being constructed at Kimberley for the convenience of employees of the Sullivan mine and mill. The company has stockpiled sufficient silica ore to suspend mining operation at its Grand Forks silica property. When shipments of gold ore were being treated at the Trail smelter there was ample silica content to meet smelting requirements, but after such shipments had been discouraged the company found it essential to provide its own silica.

YUKON TERRITORY

▶ United States interests have acquired an option on the Lone Star lode-gold property, near Dawson, and have made an examination with a view to entering production. The mine, which is equipped with a stamp mill, is a former producer and is generally regarded as a big low-grade prospect. Placer gold valued at more than $120,000,000 has been recovered in the creeks immediately below the lode.

▶ Dredge No. 3 is the only dredge operating for Yukon Consolidated Gold Corp., Ltd., at present. The mildness of the winter has permitted the continuance to this date. Gold recoveries have been better than anticipated, despite the drastic shortage of labor. C. E. MacLeod, secre-

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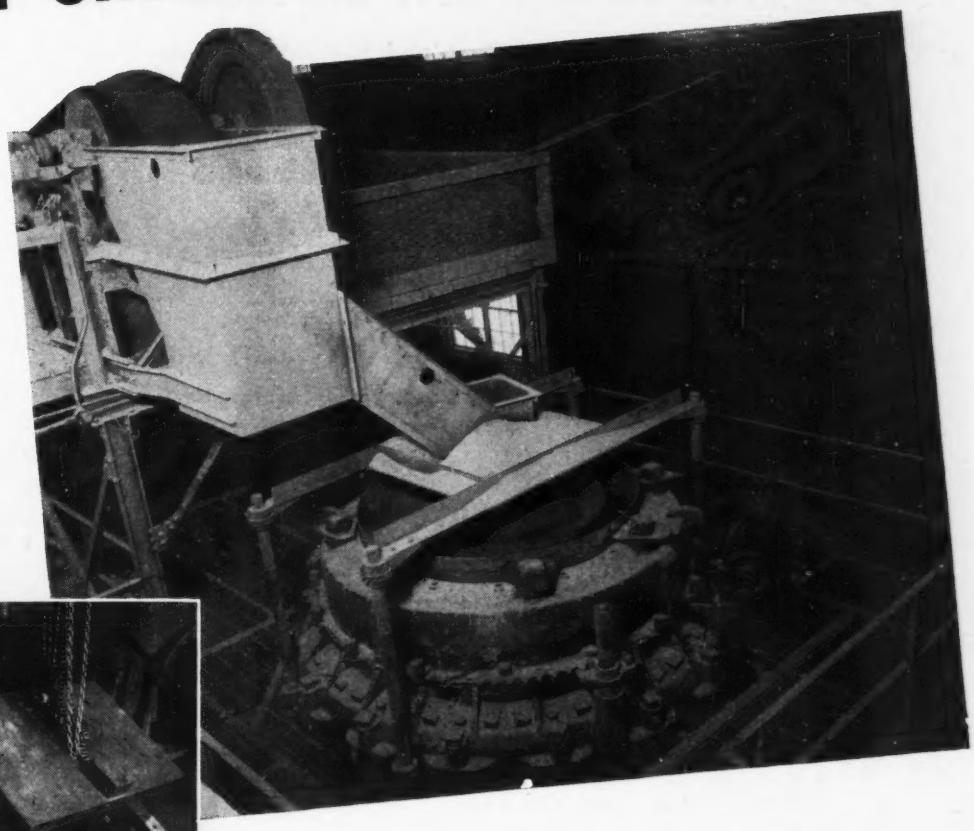

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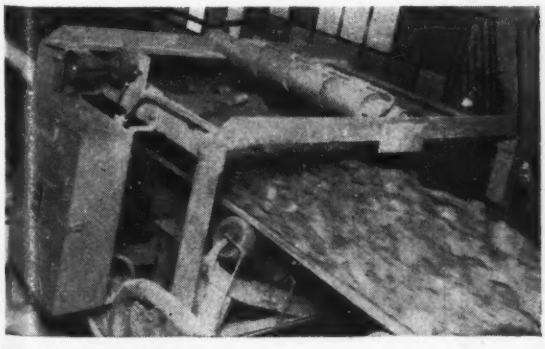

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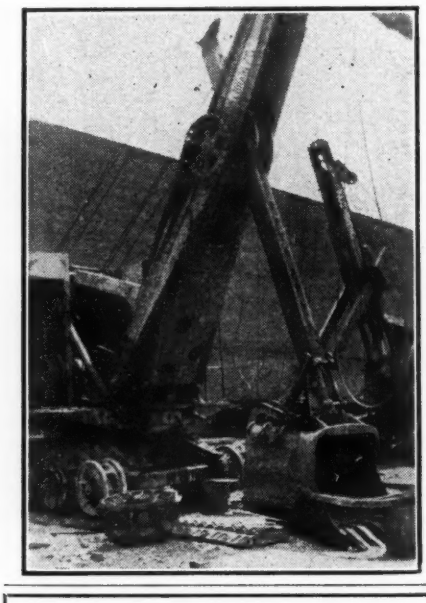

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Canada *(continued)*

tary, states that next year's operations will be dependent entirely on the labor available. At present it is indicated that three dredges will be commissioned.

▶ Tom McKay reports that he has discovered a 20-ft. vein of scheelite in place in the Mayo district. His partner is Joseph A. Walsh, a pioneer of the district and owner of extensive silver-lead properties in that region. The particular location of the scheelite discovery is on Cement Creek, a tributary of McQuesten River. The owners plan to open the property next season.

▶ William A. Williams reports that an Idaho company has a new dredge which will be operated on Williams' extensive placer ground on Sixtymile, near Dawson, as soon as gold mining conditions improve.

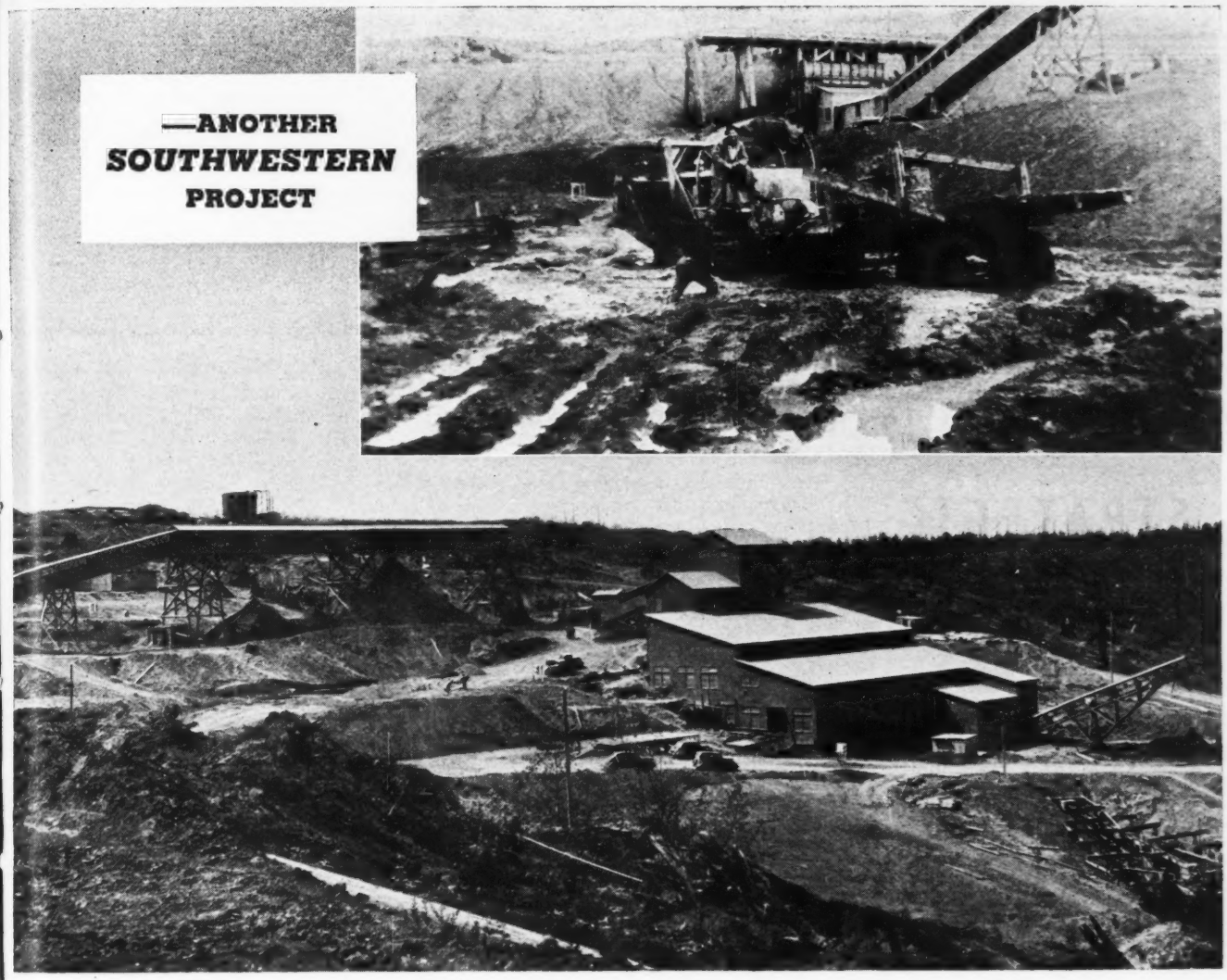
MEXICO

Mining prospects improve—Ask metal price equality with U.S.—Dos Carlos in difficulty

▶ Mexico was justified in faith in her No. 1 industry, mining, with the advent of winter, for conditions are definitely better in that business, in practically all its departments. Production is at a high level and so are exports, especially those of key metals and minerals and all the industrials, though there is an official ban on the release of precise figures covering these activities. Nevertheless, information gained in mining and railroad circles proves that both these endeavors are currently very good and prospects are that they will progressively improve.

▶ The industry is optimistic about improving road and railroad transportation facilities in 1944. The Ministry of Communications and Public Works announces a particularly ambitious highway works program to be executed by the federal government in cooperation with various state administrations, and by some states. Roads in key mining zones are to have the preference in this program. The National Railways announces improvements to rights-of-way and rolling stock in 1944 and the placing into service of more freight cars and locomotives next year, a circumstance that will be of direct benefit to mining.

▶ The National Proletarian Confederation is campaigning for what it calls a "price equality": that the U. S. government pay the same rates for Mexican mining products it imports as it does for American-mined metals and minerals it purchases. The Confederation argues that this price equality is only fair, as Mexico's contribution of strategic metals and minerals is entitled to such a concession and that price parity by the U. S. government with American mining products would be of great economic benefit to Mexico. The proletarian organization sees such a price equality as being of especial benefit to Mexico's mining cooperative societies. For



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WHEN Southwestern was commissioned to design and construct mills to recover chromite from the ancient beaches of Oregon, now 350 feet above sea level, instructions were to proceed with all speed.

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Conditions dictated the erection of two separate plants,—a gravity milling plant to produce bulk concentrate, and a re-treatment plant employing magnetic separation and flotation to raise the grade of concentrate and recover by-product minerals. The chrome bearing sands also contain zircon, ilmenite, magnetite, gold, silver, platinum, garnet, silica, iridium, and other elements.

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Illustration above shows 2000 ton concentrator constructed for Krome Corporation. Bulk concentrate produced here by tabling and flotation is trucked nine miles to the custom processing plant also designed and built by Southwestern. Inset shows some of conditions at the start.

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Mexico *(continued)*

one thing, the Confederation contends, this benefit would enable these cooperatives to pay the income tax as does every other business in Mexico. The Confederation has asked the Mexican government to negotiate with Washington for the price equality it advocates.

▶ New trouble has developed for Mexico's pioneer mining cooperative society, the Dos Carlos, which was organized in June, 1937, by the Cardenas government to run properties at Pachuca, Hidalgo, of the British-owned Cia. Minera Dos Carlos, S. A., which quit because it found the work unprofitable. The rank and file of the Dos Carlos cooperative's members are displeased with the way the executive committee is conducting their business. Contending that mismanagement is a prime reason for the cooperative's poor economic condition, many members have petitioned President Manuel Avila Camacho to order an investigation of the enterprise. This cooperative has often been financially aided by the federal and state governments, the national miners' union, and individual miners.

▶ President Avila Camacho has ordered the Ministry of Finance to arrange financial aid for the cooperative that is working mines at Mineral El Rosario, Sinaloa, which was hard hit by the recent cyclone and attendant floods that swept that State and five others on the Pacific slope. The cooperative is said to have suffered damage to its properties of 200,000 pesos ($41,500), including putting its electric power plant and metal treatment plant out of operating condition. The presidential order leaves to the Ministry's discretion the amount of the cash aid.

▶ Most of the mining cooperatives that were organized during the Cardenas regime have become a considerable problem for themselves and the federal government, in view of their inability, to a large extent, to finance themselves adequately. A further hardship has been the necessity of the federal treasury making them pay some of the production taxes from which they were exempted by a Cardenas law enacted in December, 1938, it is said in mining circles. Unofficial estimates are that these cooperatives have a membership of some 30,000. The national miners union claims 85,000 members.

▶ Information is that the Cia. Tin, S. A., has acquired control of the Poder de Dios mine, 55 kilometers from Iguala, Guerrero. Tin was recently started by American-Mexican interests headed by Frank Campbell, Richard L. Bland, and Alfonso Cardenas, who remain as its executive officers. The Poder de Dios mine has good silver-zinc values. Tin plans extensive development of this property.

▶ The national commission for stimulation of the mining industry expects important results from explorations for strategic metals and minerals deposits, especially copper and mercury, it is making with the aid of Edward Echel, of the U. S. Geological Survey, and the Geological Institute, a department of the National University of Mexico. This quest, now in progress in Zacatecas, Guerrero, and San Luis Potosi, is to last for several months. Mexico still has important mercury and copper deposits that have not been located, the commission says.

▶ Altos Hornos de Mexico, S. A., the American-Mexican enterprise of which ex-President Abelardo L. Rodriguez is chairman of the board, that is installing an iron and steel works at Monclova, Coahuila, some departments of which are scheduled to start preliminary production in February, has seemingly attained labor peace for the duration. The Labor Ministry announces that the company and the national miners' union have made an agreement which stipulates: recognition of the validity of the agreement reached some time ago at Monclova regarding the dismissal of some employees of the foundry; the right of workers to perform, without preference, extraordinary service; the legal principle that the same kind of work must receive identical pay; the obligation to publish a seniority list of employees; and the obligation to pay the seventh day (the weekly day off with pay) to employees who are ill or are incapacitated by accident suffered in the performance of their duties.

▶ Copper production by the French-owned Cia. Minera de El Boleo, S. A., Auguste Nopper, general manager, operating at Santa Rosalia, Baja California, averaged 750 metric tons a month up to Nov. 1, 1943, it is learned from a reliable source. This company is reported to have exported 8,000 tons of this production up to Nov. 1.

▶ Work is to start early in 1944 on an important central road that will connect Concepcion del Oro, important Zacatecas mining center, and Saltillo, the Coahuila capital, announces Gov. A. Natero of Zacatecas. The work is to be financed by the federal government and the administrations of both states.

▶ The Labor Ministry is drafting an amendment to the indemnifications clauses of the federal work law to make mandatory equal compensation paid underground and surface mine workers for disability from silicosis, which the law classifies as a professional disease, sufferers from which are entitled to indemnification.

BOLIVIA

Penaranda government ousted in La Paz revolution—New party promises aid to working class

▶ Control of the Bolivian government changed hands on Dec. 20 when a revolutionary party led by Victor Paz Estenssoro, a former Finance Minister, forced the resignations of President Penaranda and his cabinet. In a short battle waged in the streets of La Paz between the revolutionaries and loyal troops, one person was killed and several persons were injured. President Penaranda made his way to Chile, where he issued a statement de-

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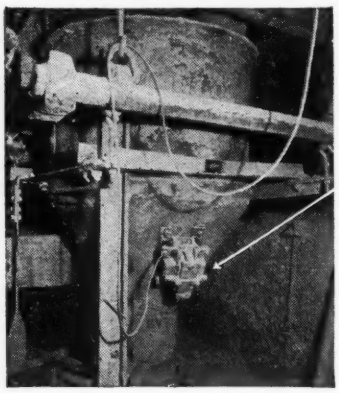

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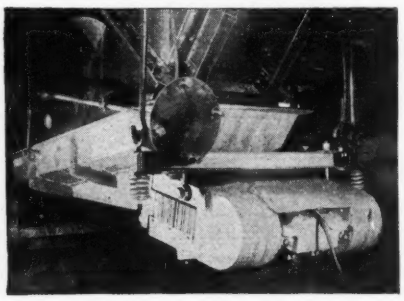

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Bolivia *(continued)*

nouncing the new movement as Axis-inspired.

Recognition of the new government by the United States was withheld, up to the time of going to press, pending a decision by the State Department as to the sincerity of motives of the revolutionary group. Sr. Estenssoro issued a statement in which he said that "internal policy will be directed, as rapidly as possible, to improving the welfare of the working class." Additional statements accused the Peñaranda government of conspiring with owners of Bolivia's big tin companies to seize the profits of tin sales to the U. S. and to prevent any benefits of such sales from reaching the people at large. For the present, at least, the change in government has made no difference in the tin market, and the new party has assured the U. S. that existing metal contracts and other agreements with the United Nations will continue to be observed.

Producers of Bolivian tin have for several months been arguing that the 60c. price for Bolivian tin was too low to cover costs, which have risen markedly since June 30, 1942, when the 60c. price went into effect. Both wages and supplies and machinery costs have gone up.

On Sept. 22, 1943, the U. S. State Department, through the Bolivian embassy in Washington, made a proposal to Bolivian producers based on a price of 63½c. per pound of tin for the term of one year beginning Oct. 1, 1943. Also included were raises on returning charges, unit deductions, and penalties for impurities. This proposal was found unsatisfactory by the producers.

On Nov. 2, 1943, U. S. Commercial Co., to which Metals Reserve has assigned its rights and obligations, made a new proposal. Basically, it consisted of a price of 63½c. per pound over two years, with higher deductions than those paid at present to take care of treatment costs, penalties for impurities, and smelting losses. These terms have also been found unsatisfactory by the producers.

With negotiations at this stage, it had been rumored in La Paz that a commission was soon to go to Washington to negotiate the question more actively. Dr. Manuel Carrasco, president of the Bolivian Congress, and Sr. Miguel Etchenique, of the Banco Minero de Bolivia, were to have headed the commission, but the execution of this plan appears to have been at least delayed by the revolution.

The feeling of uncertainty regarding the future of Bolivian mining is further aggravated by the fact that tungsten and antimony, exports of which are second only to tin in importance to Bolivia, are facing a problematic future. Negotiations between producers of tungsten and antimony and Metals Reserve Co. with the purpose of extending the present contract which expired on Dec. 31, 1943, for the sale of tungsten, and to obtain a larger quota for antimony, have so far made little headway.

Total tin exports, going to the U. S. and Great Britain, for the first ten months of 1943 were 33,195 metric tons. From that figure, and from the trend of present production, it may be predicted that total production of Bolivian tin for 1943 will amount to about 40,000 metric tons.

It is reported that work is well advanced on the 250-ton pilot plant which will test the Tainton process on the tin ores of Cia. Minera Unificada del Cerro de Potosi, one of the Hochschild properties. The process, which is based on the volatilization of tin, was developed by U. C. Tainton in his laboratory in Baltimore, Md. Mr. Raymond Beard, acting general manager for Hochschild S.A.M.I., is directing the job.

▶ Mining corporations and engineers have founded the Instituto Boliviano de Ingenieria de Minas y Geologia (IBIMIGEO), affiliated with the Pan American Institute, which has its principal office in Santiago, Chile. The Bolivian Institute, created for the advancement of the mining industry, will soon start publishing a magazine called *Mineria Boliviana*. Headquarters are at Calle Junin 512, or Casilla 140, La Paz, Bolivia.

AUSTRALIA

Central Norseman reports year's operation — Victoria's only flotation mill a success

WESTERN AUSTRALIA

▶ Western Mining Corporation, Ltd., which acts as general managers and consultants to Central Norseman Gold Corp., N. L., which operates at Norseman, has issued its report for the year ended March 31, 1943. Operations at the Central Norseman property were affected by the reduction of manpower which resulted in the withdrawal of all fit younger men. The year was notable for the payment of the first dividend of 1s. per share, amounting to £A80,000, by Central Norseman and also by Western Mining Corp., which distributed 6d. per share. Central Norseman's production was 82,150 tons of ore and 70 tons of purchased sands, from which 38,526 oz. of gold and 24,720 oz. of silver were recovered. The average grade recovered was 9.37 dwt. gold and 6.01 dwt. silver per ton, the net value after deduction of realization charges and tax being £A375,358.

In the northern stopes the increased distances of the faces from the levels necessitated the use of more scrapers than normal. The grade of ore was higher, for it was found that the high-grade stopes extended beyond the expected limits of the ore reserves. Development work totaled 3,678 ft., including 3,137 ft. of driving and crosscutting and 541 ft. of winzing and raising. In addition, 4,758 ft. of diamond drilling was completed underground. Development footage was less than in the previous year, due to shortage of labor, and the area of reef prospected was consequently less.

Proportion of payable footage to total footage on reef was 15.4 percent, compared with 30.5 percent in the previous period; average grade increased from 7.75 dwt. to 12.7 dwt. per ton. An interesting

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Australia *(continued)*

development was the opening up of high-grade ore in a drag fold on No. 11 level, where, owing to the shape of the fold, driving on the shoot was almost at right angles to the general strike of the reef. The average value disclosed for a length of 113 ft. was 26.2 dwt. gold per ton over a width of 69 in. Values of 9.7 dwt. per ton were carried for 181 ft. on No. 14 level north drive.

Reserves of proved and probable ore in the Mararoa reef, the principal orebody, were estimated at 288,500 tons, with an average grade of 7.0 dwt. gold per ton, a decrease of 26,000 tons compared with the previous estimated reserves, and, in addition, there were 21,000 tons of ore assaying 7.2 dwt. per ton in the Lady Miller mine. The average tonnage treated per four-weekly period was 6,325 tons, compared with 8,877 tons in the previous year, the mine being unable to produce normal output owing to the labor position. Head value of the ore treated was 9.66 dwt. per ton, residues assayed 0.29 dwt. per ton, and recovery was 97 per cent. Average operating costs per ton were: mining (excluding development), 26.62s.; treatment, 10.15s.; total, 36.77s.

▶ Western Mining Corp., Ltd., finished operations at the small but rich Cox's Find mine, at Erlistoun, where ore averaging about 15 dwt. per ton was mined from a drag fold of a pronounced nature in a bed of sedimentary rock between lavas. Much of the ore assayed up to 23 dwt. gold per ton, the output of the mine being 1,700 tons of ore per month. Below No. 5 level the fold became very tight, with a considerable flattening in dip, and the exploration of a minor fold to the northward proving unsuccessful, reserves were extracted and the property was abandoned. The Corporation holds several other properties which are in the exploratory stage, but work has been suspended for the duration of the war.

QUEENSLAND

▶ Mt. Morgan, Ltd., in the year ended June 29, 1943, earned a net profit of £A82,077, compared with £A127,314 in 1942. Cost of wages and stores increased as well as the cost of transportation; a lower tonnage of ore was mined and treated owing to labor shortage, and the grade of ore was somewhat less than in the previous period. Open-cut mining operations were carried on without serious delay from climatic conditions.

Work was largely confined to the removal of overburden, much of which was sent to the mills, and of the total ore treated, 71.6 percent came from outside ore reserves. During the period the amount of overburden discarded and dumped was 1,527,064 tons, compared with 1,780,064 tons in 1942, the ratio of overburden removed to sulphide ore treated being 1.85 tons to 1 ton, as compared with 2.09 tons to 1 ton in the previous period.

Much burnt ore and stope filling from the mine fire area of 20 years ago was met and at times the lime addition in the

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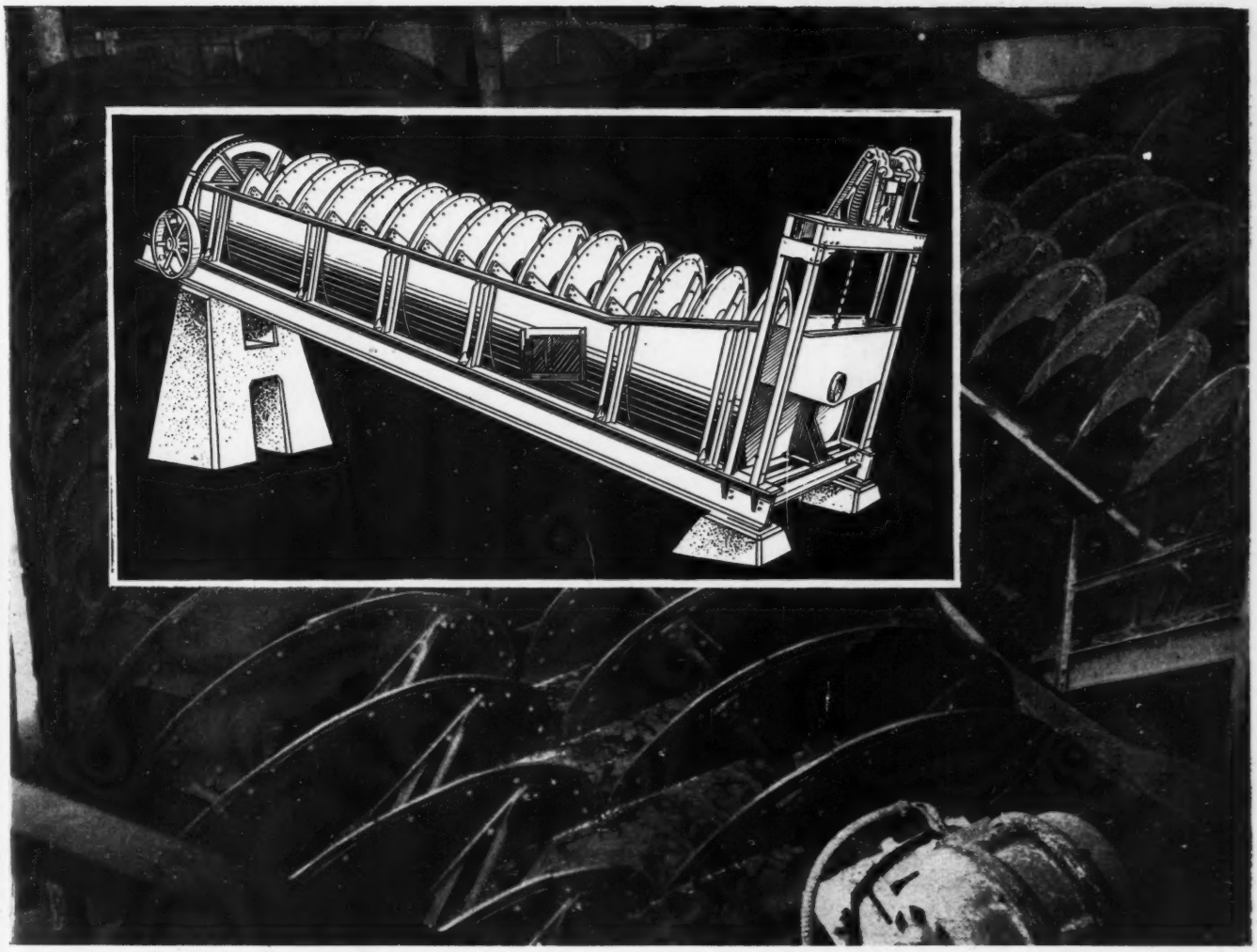

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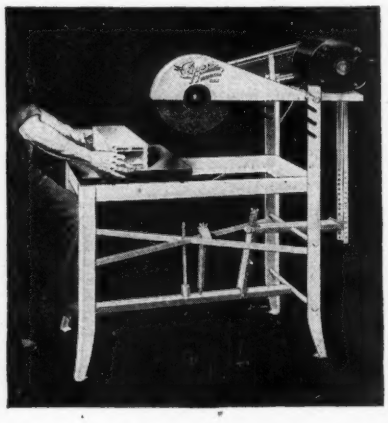

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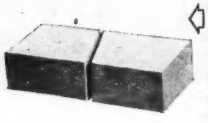

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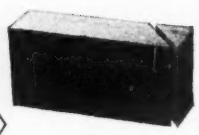

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Australia *(continued)*

mills was as high as 70 lb. per ton, as against 44.7 lb. which is the average quantity required. No. 1 mill ran 99 percent of full time. The ore showed an improvement in the copper content but a fall in gold values. Precipitation by scrap iron of copper and gold in the slime thickener over-flow continued satisfactorily and the precipitation boxes are to be increased. Production of pyrite concentrate has been discontinued.

No. 2 mill operated continuously and the ore treated showed an increase of 0.5 dwt. per ton in grade. Total ore treated in both mills was 37,030 tons less than in the previous year. In the smelting plant, No. 1 reverberatory furnace has achieved the remarkable performance of running for 34.5 months without major repair. Capacity and efficiency have decreased, but construction of No. 2 furnace is proceeding and it will be in commission by the end of the year, the work having been delayed by wartime conditions.

The company is managing, without charge, the Mount Chalmers copper mine, which has been opened up with money provided by the Commonwealth government with the object of assisting to meet the country's copper requirements. Construction is proceeding and is nearing completion. Output was limited considerably owing to shortage of men. The ore is transported to Mt. Morgan for treatment at the company's works. Metallurgical research is a prominent feature in the work at Mt. Morgan and much attention is devoted to the social and welfare conditions of employees.

VICTORIA

► Maude and Yellow Girl Gold Mining Co., N. L., at Glen Wills, in the mountains of the northeast of the State, continues successful operations. The ore occurrence is a quartz reef having considerable strike length and differs from the usual Victorian gold occurrences in being highly mineralized, the ore carrying pyrite, chalcopyrite, with some galena and zinc blende, whereas the usual ore type of the State is quartz carrying free gold and a small percentage of auriferous pyrite, or to a lesser extent, arsenopyrite. It is the only mine in Victoria in which flotation is an important part of the milling operations. In the financial year ended June 30, 1943, the company, despite prevailing difficulties, was able to make a profit of £A13,253. Little development was possible and the total amounted to 477 ft. Stoping was continued at seven levels, and values were generally good. Lode widths are narrow, approximating 3 ft., but payable ore is continuous for a strike length approximating 800 ft. Shrinkage stoping is the standard method of mining. Ore reserves were estimated at 72,280 tons, including 13,300 tons of broken ore in stopes. The mill, which includes stamps and a ball mill, treated 10,690 tons of ore for a recovery of gold in bullion and concentrates, amounting to 4,739 oz., the average recovery being 8.9 dwt. per ton, or 1.5 dwt. higher than

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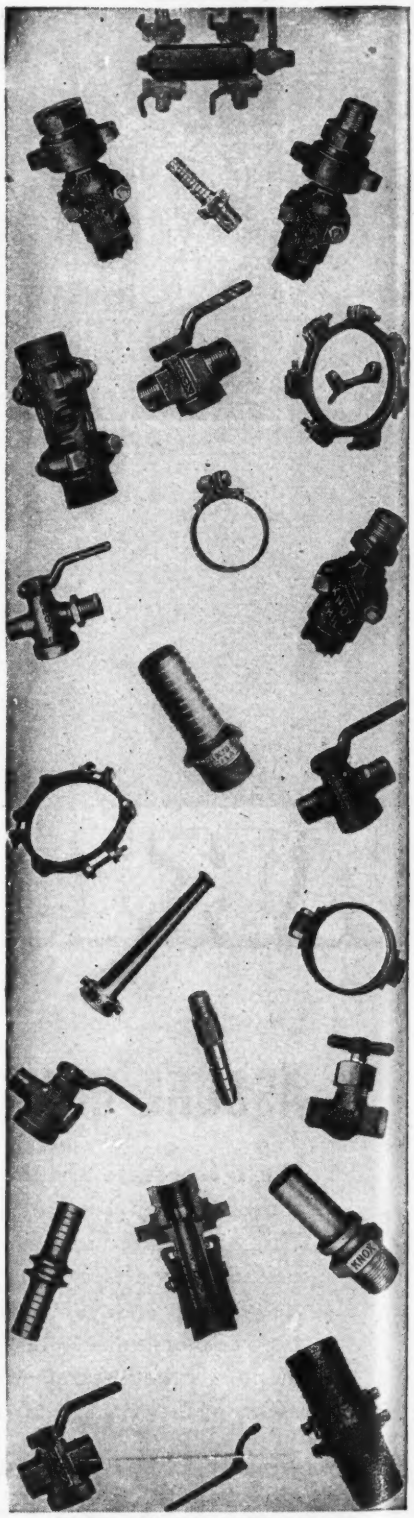

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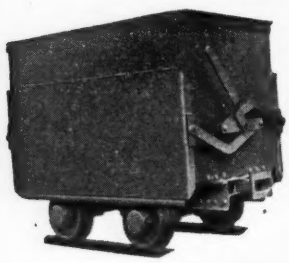
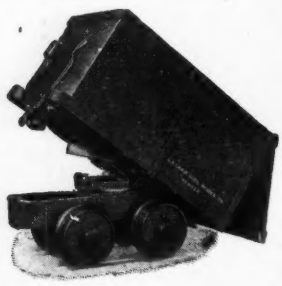


A ◆ Card designs cars to meet each mine's individual conditions.



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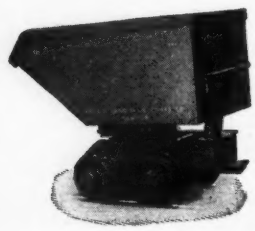


Ask for Catalog 40 A ♣

C.S. Card Iron Works Co.
Denver, Colorado

Australia *(continued)*

in the previous year. Free gold is recovered by amalgamation and the concentrate from the flotation section is dispatched to the smelters at Port Kembla, in New South Wales. Transport on concentrates is an important item in costs, as it includes 60 miles of road cartage to rail. The lode occurs in schist and granite and was originally worked from an adit having a length of nearly 2,000 ft. before the lode was reached. As the present workings are at greater depth, the mine is now worked by an internal shaft, and ore is transported through the adit to the mill by electric locomotive.

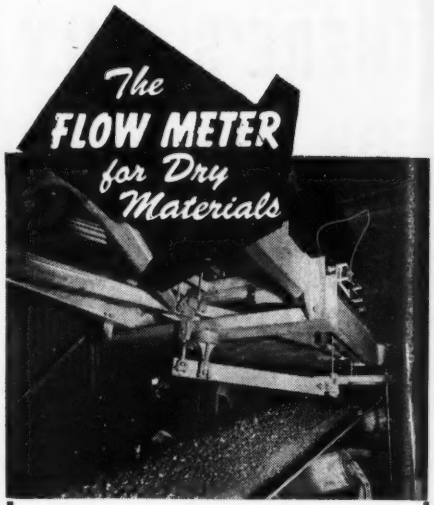
NEW ZEALAND

▶ The Blackwater Mines, Ltd., one of the largest lode gold mines in the Dominion, earned a profit of £stg.56,063 in the year ended Dec. 31, 1942, according to the balance sheet recently issued. During the year the company treated 42,676 tons of ore having an average grade of 8.74 dwt. gold per ton, from which 17,533 oz. of gold was recovered, equivalent to 94.03 percent of the head value. Clean-up of the old mill gave another 119 oz. of gold, making the total recovery 17,652 oz., compared with 19,035 oz. in the previous year, when the grade of ore was 1.25 dwt. higher. The fall in grade for the year was due largely to abnormally high dilution in the working of a narrow lode, arising from shortage of skilled labor underground. Development work was satisfactory, and a total advance of 2,438 ft. was recorded, of which driving on reef comprised 1,462 ft., exposing 1,023 ft. of ore having an average grade of 12.23 dwt. per ton over a width of 26 in. On No. 15, or the lowest, level 897 ft. of driving exposed 747 ft. of ore assaying 14.4 dwt. per ton over a width of 20.6 in., an increase of 1.38 dwt. compared with No. 14 level, but a decrease of 3½ in. in width. Ore reserves were estimated at 95,673 tons having an average value of 9.55 dwt. per ton, being an increase of 3,365 tons and a decrease of 0.4 dwt. per ton on the previous year's estimate. Comment was made in the report that the total taxes paid to the British and Dominion governments amounted to about 70 percent of the company's profit for the year.

AFRICA

Orange Free State prospects improve—Sierra Leone company finds large diamond

▶ West Witwatersrand Areas has acquired further options in the Orange Free State. East Rand Consolidated is reported about to form a subsidiary to explore its holdings there, and New Union Goldfields and Consolidated Goldfields of South Africa, it is now made public, have optioned extensive areas. Practically all of the leading South African gold mining and mining finance companies now



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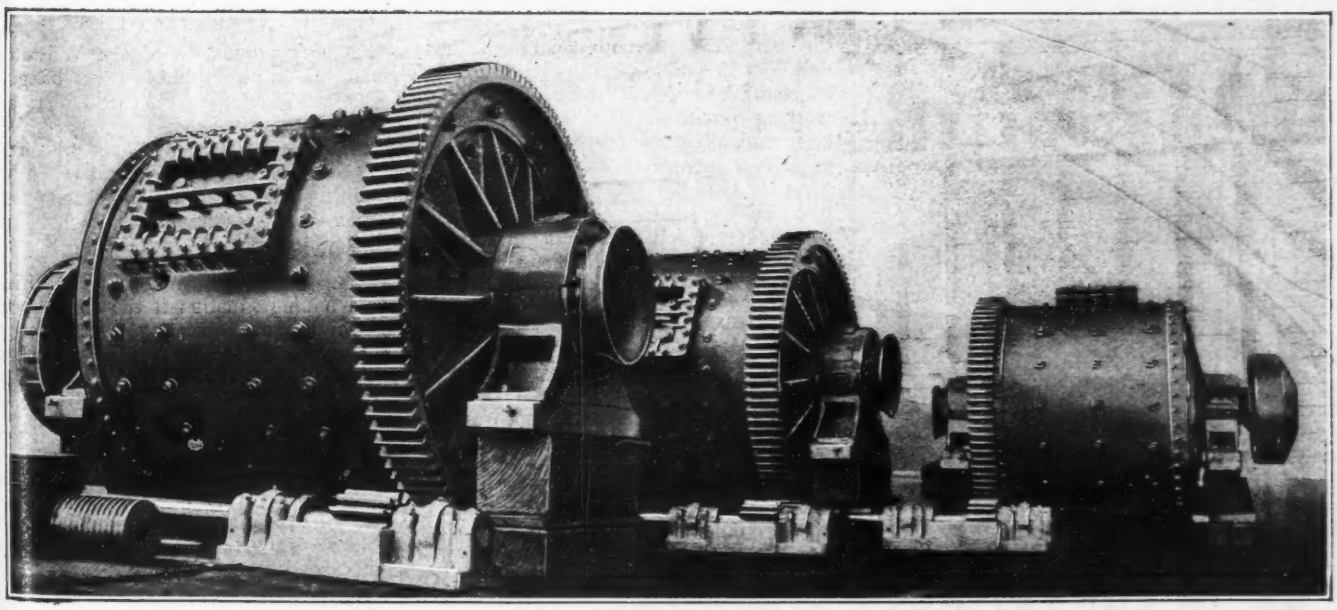
Write today for our recommendations on your particular problem. And remember that Straub Engineers are alway at your service to help with your milling plans or projects.



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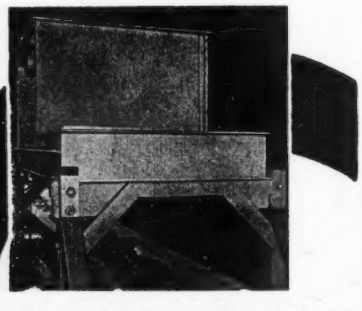

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Africa *(continued)*

have interests in the Orange Free State, and predictions are heard that it is the coming great gold field. It is even claimed that but for the war at least 30 farms would now be in course of extensive exploration. The end of the war will surely be followed by the flotation of several companies and by shaft sinkings. Nearly all of the many holes so far drilled which have intersected the basal reef, have disclosed high values. The nine successful borings by African and European Investment averaged 26.9 dwt. per ton over widths averaging 17.6 in. and these seem to prove a very extended area far on into the field.

▶ Of course the Blyvooruitzicht development is largely responsible for the growing confidence in the potentialities of the Orange Free State area as a gold field. Blyvooruitzicht is fully maintaining its early promise. Though still working from a single shaft, 26,758 ft. of development work was done during the past year. The 16,860 ft. sampled on the Carbon Leader averaged 60.6 dwt. per ton over a width of 13 in. Developed ore is now calculated as 1,426,000 tons averaging 15.1 dwt. per ton over an assumed stoping width of 45 in. Carbon Leader continues 100 per cent payable. Development work has been done on all levels from No. 1 to No. 7. The main haulage drive on the sixth level is being pushed forward at the rate of 250 ft. per month to expedite holing with No. 2 shaft. During the past year Blyvooruitzicht expended only £59,531 on capital account, leaving a balance of £82,480 on hand. Its gross working profit was £96,974, and after taxes and all other deductions an unappropriated balance of £42,992 remained. Most of the past year's capital expenditure was for equipment which included completion of initial pumping, waste removal and disposal equipment, and installation of a 108-in. ventilation fan.

▶ Dr. Hans Pirow said at the meeting of New Modderfontein Gold Mining Co. that profit had been £511,261. Dividends absorbed £245,000 of this and taxation £227,578. Payable ore developed is estimated at 320,300 tons averaging 2.6 dwt. per ton. This is a decrease of 265,000 tons from previous year's total. Reserves were 3,468,200 tons, a decrease of 1,331,100 tons, and 0.3 dwt. in average grade decreased to 2.7 dwt. There remains little prospect of opening up any large new area of payability.

▶ Nourse Mines, Ltd., reports reserves of 3,043,600 tons averaging 4.3 dwt. per ton, a decrease of 383,800 tons during the year. New development work amounted to 8,864 ft. a decrease of 10,162 ft. Sinking of No. 3 incline shaft was resumed last June, and a normal rate of sinking is being maintained.

▶ Bailey Southwell said at the annual meeting that the Sherwood Star gold mine was expected to continue the present scale of operations for about two years more and thereafter for a time on a much reduced scale. This year's dividend is expected to be reduced.

▶ Low values in the deeper levels of Cam & Motor's mine are being offset by good values in the extension of the upper levels of the Cam lode. The probability of a larger dividend is mentioned.

▶ Thistle-Etna improved its financial position slightly last year despite increased taxation. Its liquid surplus rose from £10,276 to £14,292. Ore reserves increased by 32,350 tons, to 138,650 tons averaging 4.03 dwt. per ton.

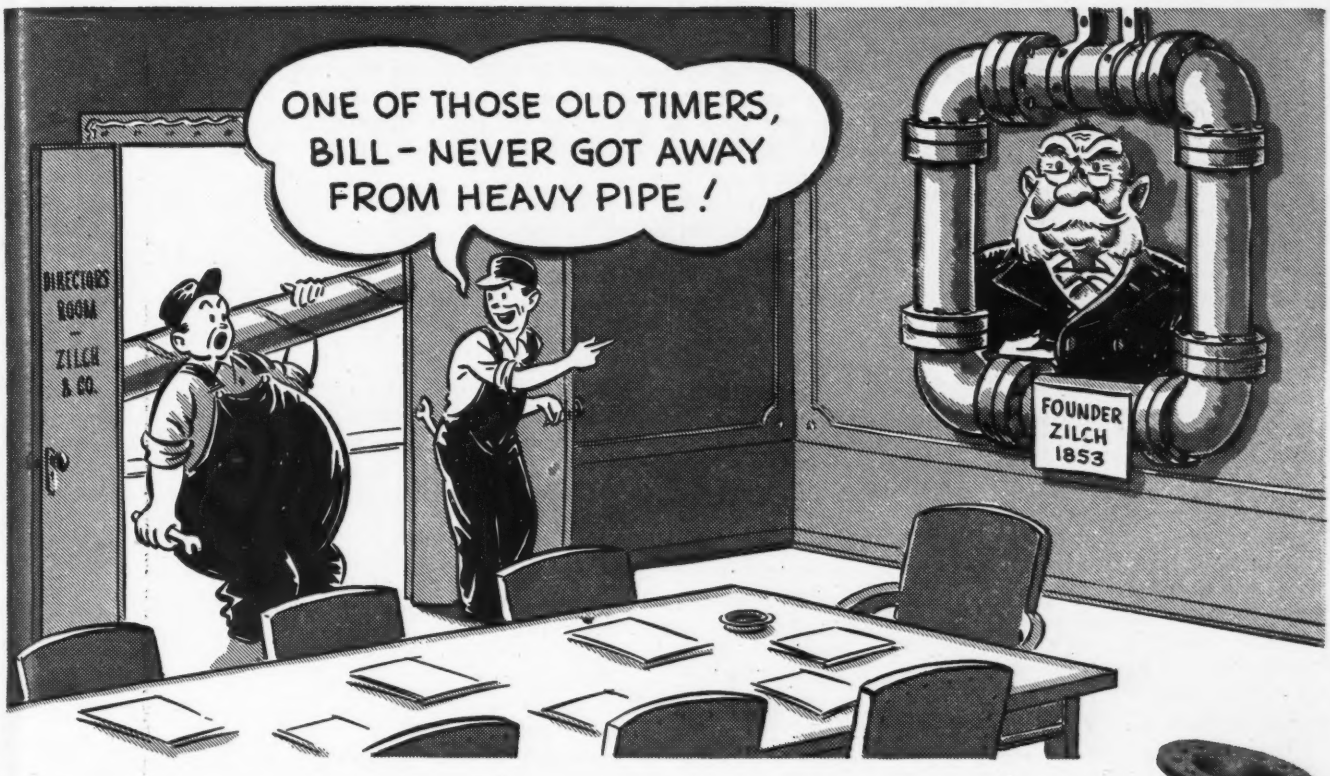
▶ The application of Bushtick Mines to the Southern Rhodesia government for the remission of royalty and allowance of the full price of 164s. 6d. per ounce for the gold it produces has been approved. This relief is conditioned on certain additional development being done and dividends being limited for the period to 6 percent.

▶ The seventh or eighth largest diamond ever discovered has just reached England. It was found in the Sierra Leone workings of Consolidated African Selection Trust, an A. Chester Beatty company. It weighs 530 carats and is said to be of the finest quality. Another weighing 150 carats has also been found there recently. An official of the Imperial Institute is quoted as saying the larger may be one of the finest stones in the world. The Sierra Leone property was acquired by the Beatty interests a few years ago and a subsidiary company owned by Consolidated African Selection Trust was formed to work it. It earned and paid a dividend the first year and its operating results have since continued to expand.

▶ October production of the Witwatersrand mines was 1,060,198 oz. of gold, against 1,054,980 oz. in September and 1,165,934 oz. in October a year ago. The native labor supply continues to shrink, 294,696 being in employment when the month ended, against 295,699 a month earlier. In February, 1942, 375,923 natives were employed.

▶ The gratifying feature of the African gold mining situation is the ability being shown to keep operating costs down to about a shilling, often less, per ton above those of two or three years ago. This is clearly due to the progressive improvement of mining and milling methods, together with the decreased amount of advance development. War taxation and higher supply costs and advanced wages are, of course, deminishing the profit available for distribution. The hope is entertained that taxation will be substantially reduced after the war ends, and an effort is now being made to convince the tax-levying authorities that in gold mining a considerable portion of the operating surplus is not profit but merely return of capital. This suggests the need of a revision in the method of mining bookkeeping, the adoption of a system which will show what portion of income actually is profit and how much of it should be distributed free of tax as capital return.

▶ It is stated on authority that the Northern Rhodesia copper companies are maintaining output on the highest possible scale to meet war demands and that further increases in production are contemplated. Capital expenditure is heavy.



But Modern Folks have swung over to Taylor Spiral Pipe!

EVERY time the need arises for pipe in your plant, ask yourself whether it isn't one of those jobs that can be taken care of with a lighter wall pipe than you have been using. If you do this, we believe you will be surprised to find how often the answer is Taylor Spiral Pipe.

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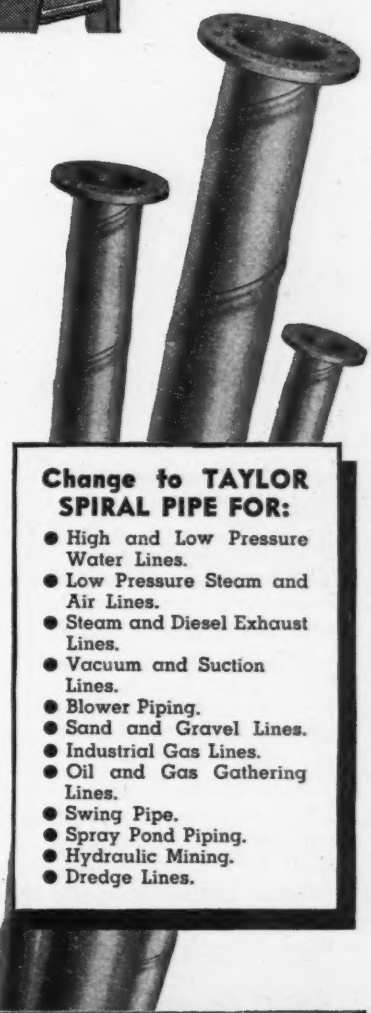

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TAYLOR *Spiral* PIPE

Change of Stoping Method

(Continued from page 66)

Stull stoping is used in the narrow veins, irregular in dip and strike, where shrinkage has proved impossible, due both to the narrowness and irregularity of the workings and to the fact that the ore breaks fine and is too sticky to run. These veins range from 3 to 6 ft. in thickness and average about 4 ft.

Preparation of a stull stope consists in taking a lift out of the back to a height of 16 ft. above the track and over the vein width for the length of ore to be mined, this length ranging from 50 to 500 ft. Upper holes 7 ft. long are put in with Canadian I.R. R51 stoper drills and blasted with 50 percent Cilgel powder, No. 6 blasting caps, and 10-ft. lengths of taped fuse. The lift is started by drilling a shatter cut at one end of the stope, the other holes breaking to a free face. In addition to the R51 stopers, of which there are 27, the company has half a dozen Canadian-Pneumatic CP43 machines.

The broken ore is removed with a mechanical loader and 1-ton cars.

Stulls, 10 to 12 in. in diameter, are put in at right angles to the stope length, spaced 5 ft. 4 in. center to center so that a 16-ft. lagging will cover three of them. They are set at about 20 to 30 deg. to the horizontal. The first row thus placed is approximately 8 to 9 ft. above the track. Each stull is set in a hitch in the footwall with a 3 x 10-in. head board against the hanging wall.

To avoid slashing out to make room for chute posts on the level the chutes are suspended by hanging rods from the stulls, as shown in the drawing. These chutes are spaced 21 ft. 4 in. center to center. A mill hole is raised over each chute as stoping progresses.

Mining starts at one end of the stope, three breasts, each 6 ft. high, being taken for the length of the stope. This mining is done in the same manner as in the stope preparation work. The broken ore from this three-breast lift is drawn off through the chutes and the stope is completely cleaned of muck by hand shoveling.

Next, another floor like the first is put in within 7 ft. of the back for the full length of the stope. Mill holes are then raised to this floor. Two sides of the mill hole are lined with split lagging, the stope walls forming the other two sides. The mill holes are "winged" to cover three sets, an opening being left in the floor wide enough to accommodate the broken ore. This opening is covered with split lagging, laid crosswise to form a chinaman chute. The broken ore from the next lift is transferred to the mill holes by lifting the crossboards and picking down the very sticky muck.

The stull stope is entered through a stulled manway at either end of the stope. When a point is reached midway between levels, a raise is put through to the level above for service and ventilation. These stopes are not filled.

As the stope progresses upward, the lagging covering the floor is salvaged and taken to the floor above.

A crew in one of these stopes consists of a miner and a helper. The helper assists in setting up the drill, scales the walls, and picks the muck down through the chinaman chute.

The ore being erratic in nature, it is not known beforehand whether or not the vein goes through to the level above. The back is therefore sampled at close intervals following the breast to determine the average grade of ore in the face before the next floor is installed. In the event that the assays show that the face is no longer in ore, further exploration is done by raising and by diamond drilling from the level above.

At times these narrow veins become very flat. In such case they are mined by open stoping, an occasional pillar being left. The broken ore in the flat section is handled by means of scrapers.

Tons Broken and Stoping Costs

Stoping is done on contract, the terms being based on performance. Wages, where they enter as such into the calculation of costs, are within the limits of the scale prevalent in Ontario gold camps. The direct costs for the average tonnage broken in the first six months of 1943 are given in the table on page 66. Labor costs include the bonus earned under contract plus the cost-of-living bonus, which amounts to 71c. a day. Overhead is not included.

Drift-set and chute timbering used in connection with the cut-and-fill stoping is illustrated in accompanying drawings, on pages 65 and 66.

Chute Loading and Transport

Ore is loaded from all chutes into 35-cu.ft. U-bottom side-dump cars, which are hauled to the ore pass in 6-car trains, having a two-man crew, by storage-battery locomotives. Cars are dumped by hand. The 20-cu-ft. cars of similar type that are used in mucking in development ground are made up of 10 or 12 to a train. A simple link coupling is used on all cars; also Timken roller bearings.

The trackage is 18-in. gage and of 20-lb. rail throughout, laid on 4-in. spruce ties, spaced 3 ft. center to center with hand-operated and double-throw switches.

Storage-battery haulage, so commonly employed in Ontario and Quebec gold camps, is used here because of the irregular and erratic occurrence of the ore. It is not practicable to drop the ore through the stopes from level to level. Instead, it must be taken out on each level to the ore pass at the shaft. Six Mancha Little Trammers and one Atlas are in service, each having a spare battery. A charging station is provided on each of six levels and there is to be one on the 12th level.

The mine is now provided with an ore-pass system from the 2d level down to the 12th. The pass is 6x8 ft. in cross-section and driven at 49 deg. It is in two sections: one from the 2d level, bottoming on the 5th, and the other from the 6th level to the 12th-level loading pocket in the shaft area. A control chute is provided on each level. It has chain gates,, operated by an air cylinder. On the 5th level the ore is transported from the control chute about 450 ft. to the 5th level 300-ton loading pocket, where it is loaded into skips. The ore pass connects with the main drive on each level and has a grizzly for dumping, consisting of 100-lb. rails spaced 10 in. apart and supported on 12x12-in. bearing timbers of B. C. fir.

Likewise, the mine now now a waste pass system extending from surface down to the 12th level loading station, with control chutes and grizzly connection to permit dumping and loading of fill at each level. This is also in the shaft area, but probably 400 to 500 ft. from the shaft collar when it reaches the surface. It comes to surface in two branches, one at the highway near the office, for receiving outside fill that is brought in; the other under the sorting plant to send rock picked out back underground. The former branch is timbered. It has been slashed out to accommodate a chute and manway, timbered with 10-in. stulls on 4-ft. centers and lined with 2-in. elm plank. A fan house is to be put over the manway compartment and a heating unit to be installed so as to blow warm air down to keep the sand fill from freezing in winter.

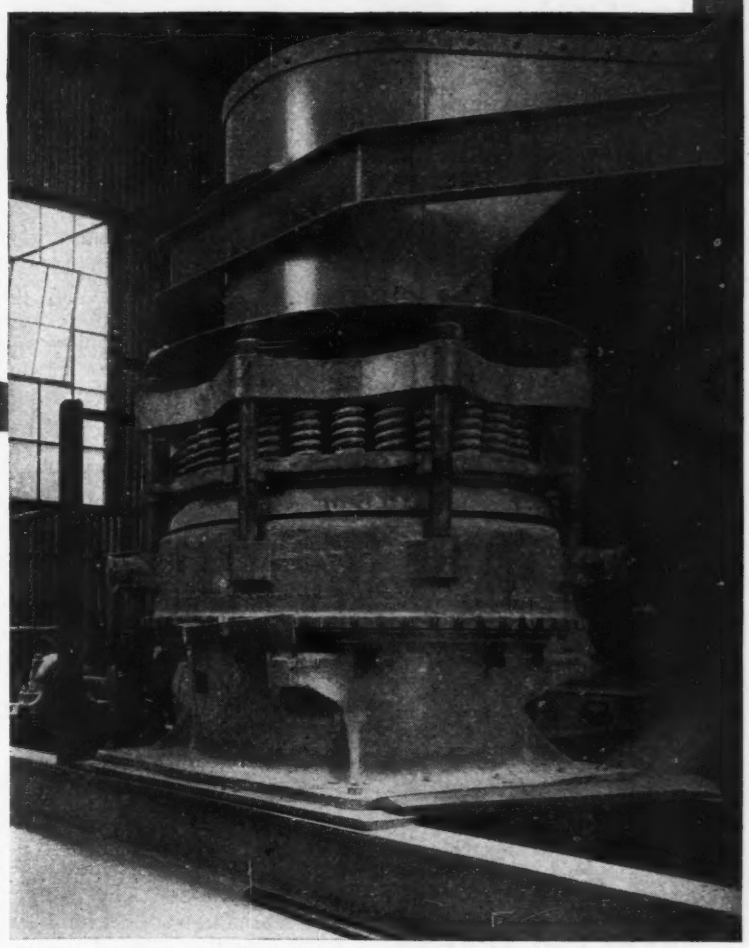
Waste is loaded from the waste pass via the control chute into the ore-measuring pockets—a deflector door

IN THE MINES OF SOUTH AFRICA

TELSMITH

Gyrasphere

REDUCES 60-70 TONS PER HOUR OF —2½" ORE TO TUBE MILL FEED IN ONE PASS



In South Africa — where men are miners and mines are productive—that's where crushers have to be crushers!

To be specific, there's the New Kleinfontein Gold Mining Co., at Benoni in the Transvaal. There, as elsewhere in South Africa, you'll find the Telsmith Gyrasphere Crusher — turning out top tonnage and a low cost product.

Theirs is a No. 36 Gyrasphere. They are feeding it 60 to 70 tons per hour — of minus 2½-in. to plus ¾-in. ore. And the Gyrasphere is taking it at choke feed and turning out one hundred per cent of minus ¾-in.—tube mill feed.

They have had this Gyrasphere for some years. Recently it was equipped with a fine-crushing concave ring and is now handling the oversize from a reduction crusher. The 75-hp. motor originally purchased with the crusher is still driving it, but the actual horsepower consumed is around 65 b.hp. when the crusher operates under full load.

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MIN.-10

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Change of Stoping Method

(*Continued from page 134.*)

being used to load it into either pocket. Waste from development on upper levels is transferred to the waste pass system or to stope fill raises as required. But on lower levels where there is no stoping the waste is transferred through the waste pass system and hoisted to surface to the 150-ton bin in the headframe and then transferred from this bin to the waste pass system again by means of a truck on the surface.

Ventilation is provided by a 22,000-cfm. disk-type fan installed on surface over No. 1 shaft. Air enters No. 1 shaft and is forced through the stoping area to the 11th level, then back and up No. 2. The air is unheated in winter and to minimize freezing the fan is then run at half speed.

Headings in long development drives are supplied with air through 12-in. galvanized pipe connected to a Venturi injection blower using air from an air line and exhausting. In a 2,000-ft. heading, three or four such blowers may be used.

Water pumped averages 75 g.p.m., being handled from shaft sump to the 13th level sump by a deep-well pump; then the 9th level by a Smart Turner triplex; thence to the 4th and from there to surface by two single-stage Cameron centrifugal pumps.

Flotation Machine Efficiency

(*Continued from page 82.*)

be pointed out, is not necessarily a measure of cell efficacy. The method does not give any data as to air dissemination and/or bubble distribution.

Another method used in this laboratory, and one that is applicable to commercial as well as small laboratory cells, is as follows: The apparatus needed is a 1,000-ml. wide-mouth flask. The bottle, filled with water or pulp, the mouth covered with the palm of the hand, is inserted, neck downward, into the pulp. When the hand is removed from the bottle mouth, bubbles flow into the bottle, displacing the water therein. With a stop watch, the time required to displace the water in the flask is a measure of the aëration at that position in the cell. By this method the pattern of bubble distribution in the cell can be accurately and quickly determined. Also, by this method the aërated condition of pulp in any cell, no matter what the make or principle of operation, can be measured.

In a number of machines in this laboratory, large and small, the aërating capacity ranges from 500 ml. which is good, to 200 ml. per minute, which is poor. This is the volume of free air escaping from the pulp per square inch of surface per minute. The degree of aëration in some cells varies as much as 100 percent over the cell surface. Cells that cause pulp swirling give strong aëration at the cell core—that is, around and near the impeller shaft. This is due to centrifugal action on bubbles. Needless to say, this is a bad condition.

The accompanying data, Tables I and II, were obtained from experiments using the "flask displacement" method. Table I shows how aëration and energy input vary with depth of water above the impeller. Table II gives similar data for varying pulp density. The flotation cell employed in these experiments was cylindrical in form and had a volume of exactly 1 cu.ft. The impeller was 6 in. in diameter and was run at a peripheral speed of 1,600 f.p.m. The impeller shaft bearings were of the antifriction type.

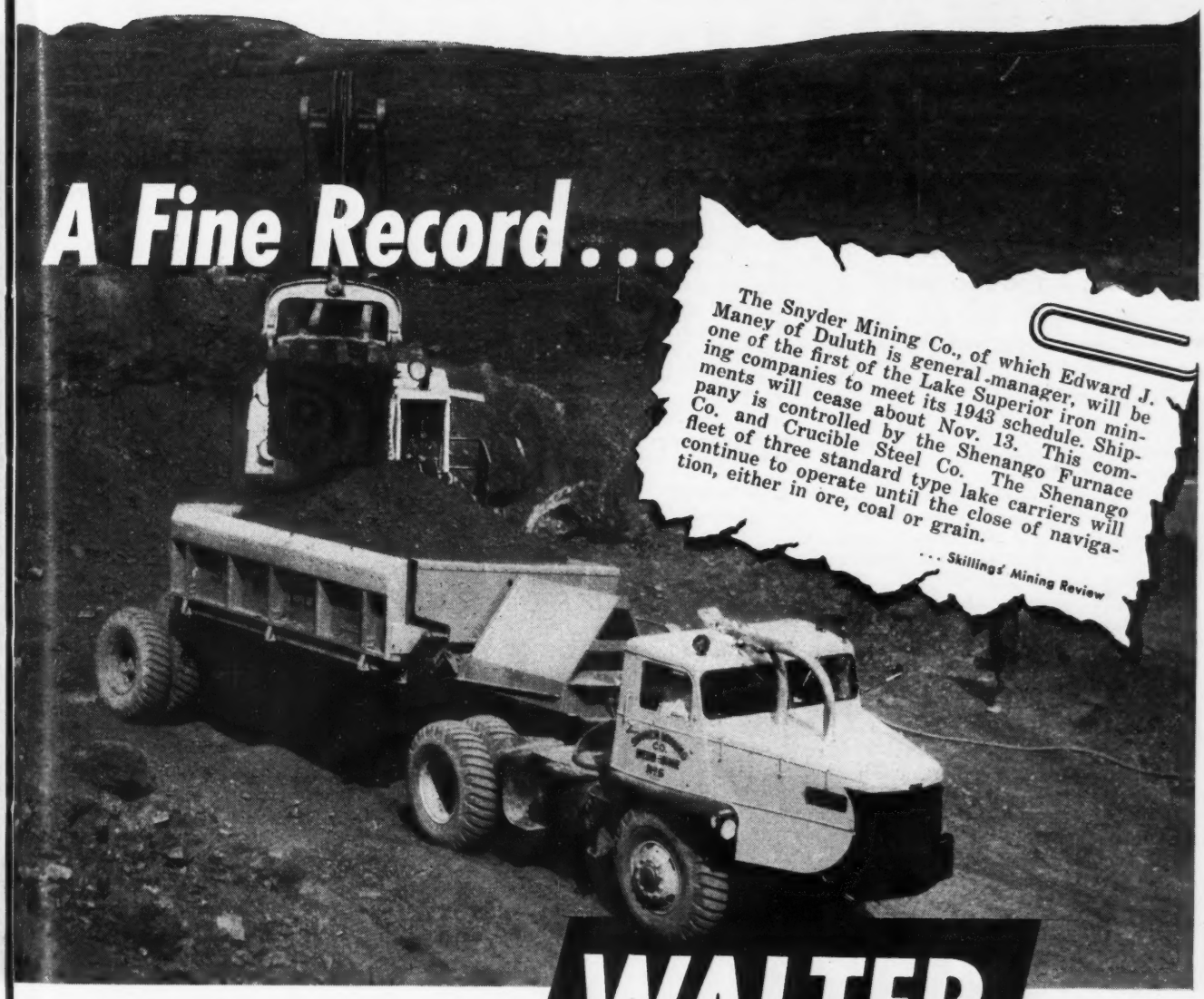
CIO Local Still Lacks Recognition at BMI

Although certified by the NLRB as the lawful collective bargaining agency for the employees of Basic Magnesium, Inc., Las Vegas, Nev., Local 629 of the Mine, Mill and Smelter Workers Union (CIO) has yet to be recognized by the company or by the government agencies concerned. In an attempt to force recognition, the local was permitted by the MMSW executive board to call a strike vote under the Smith-Connally Act. BMI's workers, on Dec. 22 by a vote of 1,700 to 1,217, chose not to strike.

Reid Robinson, president of the union, has argued repeatedly against strikes during wartime by members of the mine workers union, and has cautioned other locals against following the procedure taken in the negotiations with Basic Magnesium, Inc.

The CIO local won an election last May at the BMI plant and was certified in July by the NLRB as bargaining agent. Shortly thereafter Congress passed the Frey amendment to the National Labor Relations Act which prevented one union from replacing another as bargaining agent for a plant with which it had had a contract for three months or more. Because Basic Magnesium had been operating for several months under a contract with an AFL union, the Frey amendment prevented the establishment of the CIO union.

The NLRB has refused to enforce its certification and the War Labor Board has denied that it has jurisdiction. The company, therefore, has not entered negotiations with the CIO local, holding that the AFL contract is still valid. Conditions at the plant are reported as highly unsettled.


A Fine Record...
The Snyder Mining Co., of which Edward J. Maney of Duluth is general manager, will be one of the first of the Lake Superior iron mining companies to meet its 1943 schedule. Shipments will cease about Nov. 13. This company is controlled by the Shenango Furnace Co. and Crucible Steel Co. The Shenango fleet of three standard type lake carriers will continue to operate until the close of navigation, either in ore, coal or grain.
... Skillings' Mining Review

P.S. They use WALTER TRACTOR TRUCKS

Hats off to America's iron mines who, despite a late season opening and bad weather last year, came through to meet the great tonnage quota set for them.

An outstanding example was The Snyder Mining Company, one of the first to meet its 1943 schedule—a tribute to hard work and excellent equipment. Contributing to this achievement was the fact that the Webb mine of The Snyder Mining Company began its 1943 operations using Walter Tractor Trucks to haul ore from shovel to belt conveyor.

Here, as in other iron mines on the Mesabi and in the Adirondacks, giant Walter Tractor Trucks hauled 35 to 40 ton payloads day in and day out, often under running conditions and grades that would stop anything else on wheels. This great power and traction of the Walter 4-Point Positive Drive also makes possible Winter ore hauling where plant conditions permit, and overburden removal in roughest terrain.

There's a great performance and engineering story behind the record of Walter Tractor Trucks in iron ore hauling. Write today for full details.

WALTER MOTOR TRUCK CO. • 1001-19 IRVING AVE., RIDGEWOOD, QUEENS, L. I., N. Y.

EQUIPMENT NEWS

Battling Seabee Finds New Use for Bulldozer

During the Marines' landing on Treasury Island, in the Southwest Pacific, on Oct. 27, the Associated Press reports, Fireman First Class Aurelio Tassone, of Milford, Mass., wiped out a Jap pill box with his 20-ton Baker Mfg. Co. bulldozer, which he had brought ashore to aid in moving equipment.

Attacking the coconut-logged bunker from the rear, Tassone roared in with the blade held high as a protection against bullets. The structure collapsed. Tassone then backed off, dropped the blade, and calmly scooped several loads of sand into the wrecked gun emplacement. Twelve corpses and a heavy gun were dug out of the pillbox after the attack.

Air Circuit Breakers

Large air circuit breakers in individual metal inclosure are announced by I-T-E Circuit Breaker Co., Philadelphia, Pa. The inclosures are made of heavy-gage bonderized sheet steel and are supplied for either indoor or outdoor service. The breaker may be opened or closed without opening the inclosure.

The breakers are the I-T-E type LG and are available in ratings from 2,000 to 10,000 amp., with interrupted ratings 75,000 and 100,000 amp. Standard voltage ratings are 600 volts a.c. and 250 volts d.c. Operation may be either manual or electric.

Drag Chain Links

A new "missing link" for dragline shovel drag chain repair is now available from American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill. The manufacturer states that these links enable a quick repair of broken chain and insure a tightly-held joint.

Two types of link are made: one for larger chain of 1¼ to 2½-in. section, and the other for smaller chain of ⅞ to 1⅛-in. section. A center bar or stud in the repair links prevents kinking that might lead to destructive jerking in operating.

Clamp-Mounted Sheave

Designed for quick and easy mounting, a new sheave has recently been announced by Allis-Chalmers Mfg. Co., Milwaukee, Wis. Known as the "Magic-Grip" sheave, the new unit locks to the shaft in a tightening operation which draws a tapered split bushing further into the sheave, resulting in a positive clamp fit. The company states that this sheave can be mounted closer to the motor than conventional types and that it assures smooth running and freedom from backlash. Complete information concerning the new sheave can be obtained by writing for Bulletin B6310.

INDUSTRIAL NOTES

Army-Navy "E" awards, or renewal of existing awards, have been given to the following companies: **Koehring Co.**, Milwaukee, Wis.; **Phelps-Dodge Copper Products Corp.**, Habirshaw, N. J.; **Blackhawk Mfg. Co.**, Milwaukee, Wis.; **H. K. Porter Co.**, Pittsburgh, Pa.

The Dorr Co., New York, N. Y., is building an extension to its Westport mill, which houses the company's research and testing laboratories at Westport, Conn. The principal feature of the extension is the semi-works laboratory, where all the basic services for metallurgical and chemical operations will be available. These new facilities will make it possible to demonstrate a single piece of equipment or operate a pilot plant for a new process or product. The semi-works unit will be adequately staffed by trained personnel, and will enable the company to expand and diversify its research and engineering service.

Walter N. Westland has been appointed sales manager of **Marion Steam Shovel Co.**, Marion, Ohio. **L. C. Mosley** has been appointed manager of the mining division to service Marion's activities in the coal, metal, and non-metallic mining fields.

F. T. Scannell has been appointed general sales manager of the **Falk Corp.**, Milwaukee, Wis.

Paul Reeves has become advertising manager for **Timken Roller Bearing Co.**, Canton, Ohio, succeeding **Roland P. Kelley**, who, after 17 years in that position, has resigned to enter agency work.

Edward J. Burnell, formerly in charge of central division sales of **Link-Belt Co.**, Chicago, Ill., has been appointed vice-president in charge of sales for the entire Link-Belt company.

Eric Freitag, superintendent of construction for **Western-Knapp Engineering Co.**, San Francisco, Calif., is in New Mexico directing work on a new project of **International Minerals & Chemical Corp.**

John B. Ross, formerly with **Linde Air Products Co.**, has been appointed to the West Coast office of **Handy & Harman**, in Los Angeles, Calif. Mr. Ross will serve industries in that area in the capacity of brazing engineer in the application of silver brazing alloys.

Cleveland Rock Drill Co., Cleveland, Ohio, announces the appointment of **Robert Craig** as export manager. Mr. Craig has been district manager for the company at Salt Lake City, Utah.

M. P. O'Toole, district sales manager for **Ohio Brass Co.**, Mansfield, Ohio, died on Sept. 27 of a heart attack. He had been with the company since 1922.

R. H. McCormick has been appointed advertising manager of **American Hoist & Derrick Co.**, St. Paul, Minn.

BULLETINS

Weld Bend Testing. Convenient forms on which to record results of weld bend tests are available from Tempil Corp., 132 West 22d St., New York, 11, N. Y. Send requests on your letterhead.

Maintenance. Allis-Chalmers Mfg. Co., Milwaukee, Wis., is now publishing its "Operation and Maintenance Review," a bimonthly magazine containing tips on maintenance and articles on current trends for shopmen and executives.

Ignitron Rectifiers. Ignitron mercury arc rectifiers are fully described in a new 36-page bulletin recently issued by General Electric Co., Schenectady, N. Y.

Belt Drives. A new 70-page handbook, available from Dept. 141, American Pulley Co., Philadelphia, 29, Pa., describes the automatic belt tension control of American Econ-o-matic drives, and includes V-belt and flat belt selection tables.

Gas Regulators. The "Gas-O-Dome" regulators made by Victor Equipment Co., San Francisco, Calif., are described in a new bulletin just issued by the company.

Wire Rope. Completely indexed and subdivided for convenient use, a new 160-page buyers' guide for wire rope has just been issued by Macwhyte Co., Kenosha, Wis. A 60-page section in the guide contains information on conservation and care of wire rope. Tables and information are in accordance with new simplified practice. A copy of the guide, known as G-15, will be sent those requesting it on their company letterhead.

Bulldozers. Baker Mfg. Co., Springfield, Ill., has just published its Catalog, 839, describing a complete line of hydraulic bulldozers and gradebuilders as standardized on a wartime basis.

Silver Brazing. Handy & Harman, New York, N. Y., has available for distribution a new instruction sheet for torch brazing with silver alloys.

Timber Connectors. Designers using the timber connector method of construction, or those interested in learning more about it, should obtain the new design manual just issued by Timber Engineering Co., Washington, D. C.

Pressure-Treated Timber. Use of pressure-treated timbers in the mining industry comprises one section of a new book on preserved wood, sent free on request to Koppers Co., Wood Preserving Division, Pittsburgh, Pa.

Jaw Crushers. Pioneer Engineering Works, Inc., Minneapolis, 13, Minn., has prepared a new catalog of the company's line of welded steel base jaw crushers.

Diamond Tools. Champion Diamond Co., New York, N. Y., has available for distribution a new 4-page circular showing the various types of diamond tools which the company manufactures.

Manganese Steel. The relationship of manganese steel to the mining and quarrying industries is the subject of a 60-page bulletin just issued by American Manganese Steel Division of American Brake Shoe Co., Chicago Heights, Ill.